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# BLOODVESSELS OF THE HUMAN BODY

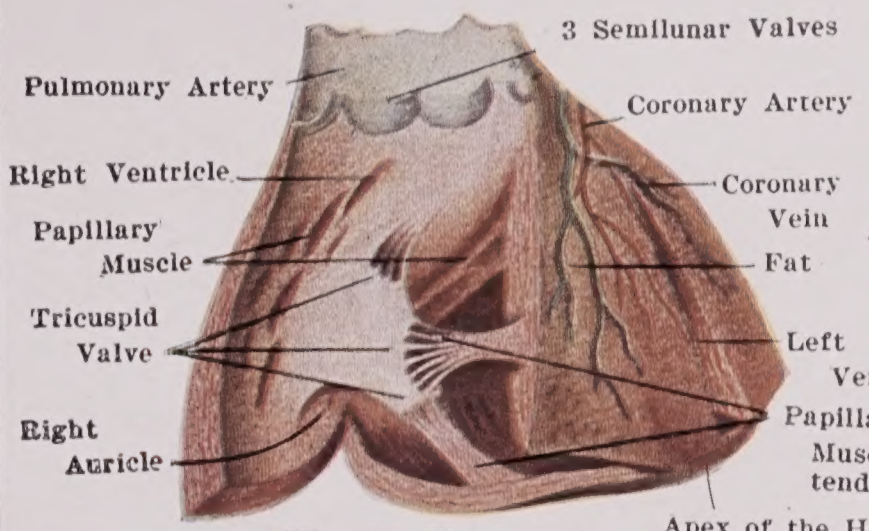


Fig. 1. The Heart.
(Both Ventricles are opened.)

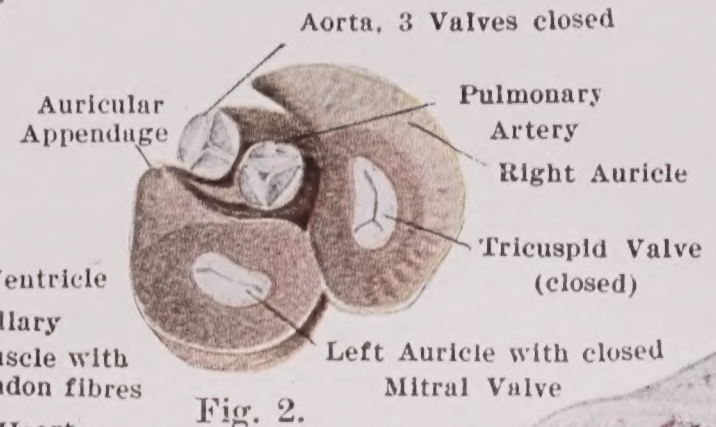


Fig. 2.
Auricles of the Heart.

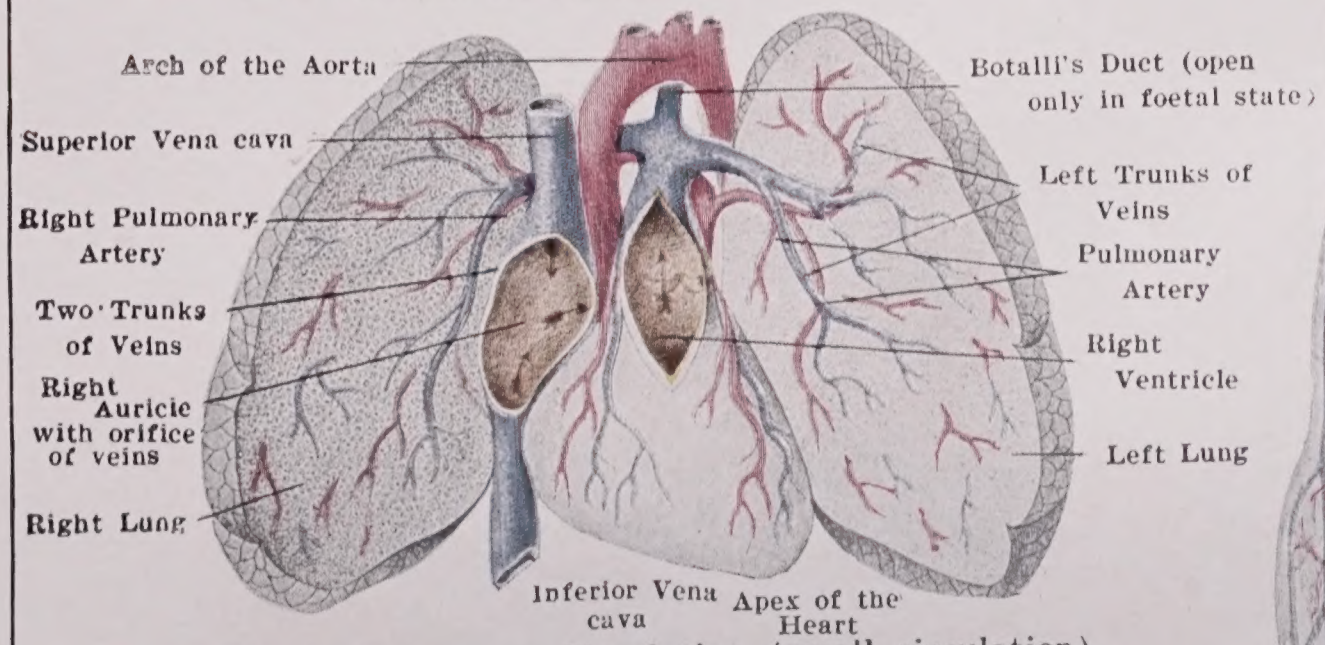


Fig. 3. Pulmonary Circulation (small circulation).

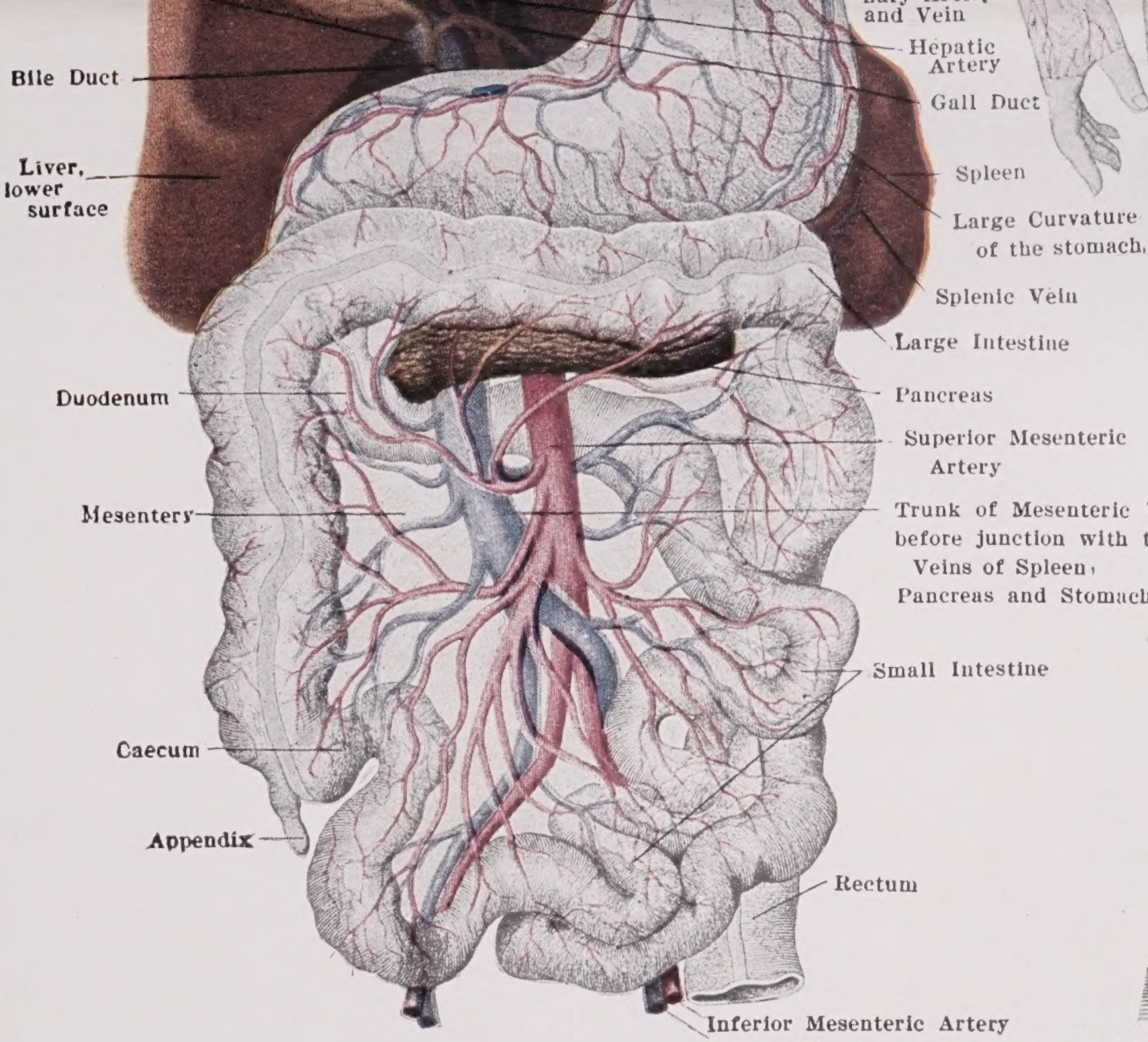


Fig. 4. Circulation of the Portal System.

(The Union of the veins of the stomach, intestines, spleen and pancreas with the trunk of the Portal Vein is covered by the stomach.)

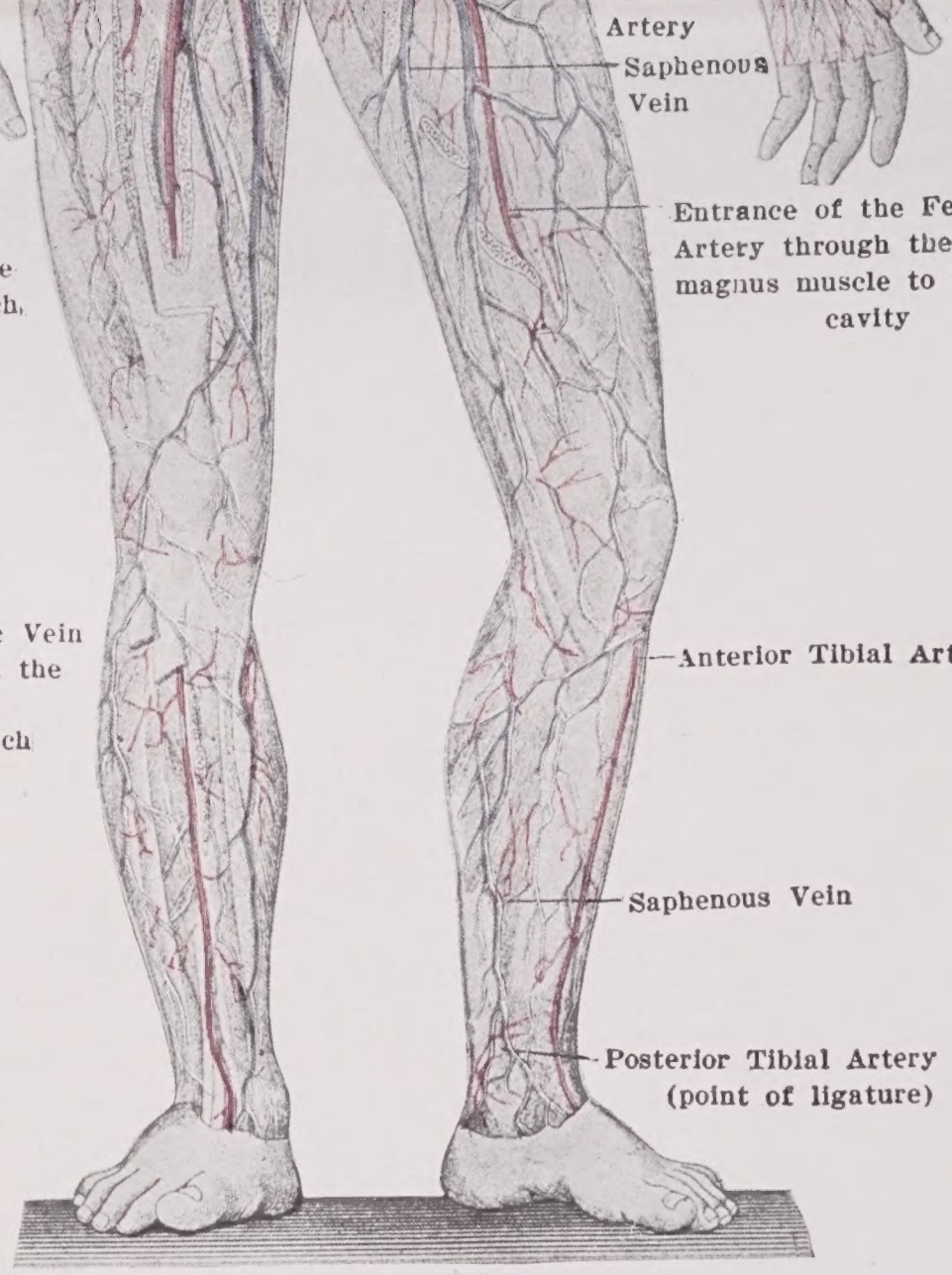
Artery
Saphenous Vein
Entrance of the Femoral Artery through the adductor magnus muscle to the knee cavity
Anterior Tibial Artery
Saphenous Vein
Posterior Tibial Artery (point of ligature)

Fig. 5. Circulation of the Blood in the Body (large circulation).

(The Viscera of the Portal System, Fig. 4, have been removed from the abdominal cavity.)

The red lines indicate the Arteries. the blue lines the Veins

# THE STANDARD AMERICAN ENCYCLOPEDIA

*A Dictionary of Universal Knowledge in eight volumes—Fully illustrated*

VOLUME VIII


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# THE STANDARD AMERICAN ENCYCLOPEDIA

IN EIGHT VOLUMES—FULLY ILLUSTRATED

Volume VIII

THURLOW—ZYMOTIC DISEASES

**Thurlow, Edward, Lord,** an English jurist; born in Bracon-Ash, Norfolk, England, in 1732. He was called to the bar in 1754, made king's counsel in 1761, and won great reputation by his speech in the Douglas case. In 1768 he entered Parliament. In 1771 he became solicitor-general and zealously supported the policy of the government toward the American colonies. In 1778 he was made lord chancellor, being raised to the peerage as Baron Thurlow. Pitt suspected Thurlow of intriguing with the Prince of Wales, and from this time an open disagreement took place between them. Pitt demanded his dismissal, to which the king at once agreed, and he was deprived of the great seal, June, 1792. He died in Brighton, Sept. 12, 1806.

**Thurman, Allen Granbery,** an American lawyer and political leader; born in Lynchburg, Va., Nov. 13, 1813. In 1819 he was taken by his parents to Chillicothe, Ohio, where he was educated. He studied law in the office of his uncle, William Allen, by whom, after being admitted to the bar in 1835, he was taken into partnership. He was elected as a Democrat to Congress in 1844; was a justice of the Supreme Court of Ohio in 1851-56, and was elected United States senator in 1868 and 1874. He drafted and secured the adoption of the "Thurman Act," designed to compel the Pacific railroads to fulfill their obligations to the government; took part in framing the bill providing for the Electoral Commission; and was a member of the commission and a warm defender of its constitutional authority. He was a member of the International Monetary Conference in Paris in 1881; was a candidate for the Democratic presidential nomination in 1876, 1880, and 1884; and in 1888 was nominated by acclamation for vice-president on the Cleveland ticket, which was defeated by Harrison and Morton. He died in Columbus, Ohio, Dec. 12, 1895.

**Thurn and Taxis, Princes of,** a princely house with high rank, hereditary dignities, and vast possessions in Austria, Bavaria, Würtemberg, Prussia, and Belgium, the heads of the two main lines being resident at Ratisbon and at Laucin in Bohemia. Descended from the Della Torre of Milan (whence the first part of their name), with a castle of Tasso or De Tassis (whence the second), members of this house have been distinguished in connection with posts. One established posts in Tyrol in 1460; another, ennobled in 1512, established the first post between Vienna and Brussels in 1576. His descendant became in 1595 grand-master of the posts of the Holy Roman empire, and secured the right of carrying on the posts of the empire which extended from Hamburg to Rome, and from Paris to Vienna, for himself and his heirs as a hereditary privilege. In 1681 the principality of Thurn and Taxis in the Netherlands was conferred on the head of the house; and in 1698 the princely rank and title were made hereditary, and passed to all members of the house. The postal privileges were gradually limited by the governments of the various countries; but it was not till 1867 that Prussia secured by treaty with the family the abolition of the monopoly.

**Thursby, Emma,** an American soprano singer; born in Brooklyn, N. Y., Nov. 17, 1857; studied under Lamperti in Milan, and under Madame Rudersdorff; made a tour of the United States and Canada in 1875 and in England and France in 1878-1879, and was prima donna in the company of Maurice Strakosch in 1880-81. She afterward gave concerts in the United States, and in 1903 appeared in Japan and China.

**Thursday,** the fifth day of the week. The word was originally Thor's day, *i. e.*, the day of Thor, the god of thunder. The Romans similarly called the day *dies Jovis* = the day of Jove or Jupiter, the god corresponding to the Scandinavian Thor.

**Thursday Island,** a small island of Queensland, Australia, in Normanby Sound, Torres Strait. It is a government station, and the harbor—Port Kennedy—is one of the finest in this quarter. It is in the direct track of all vessels reaching Australia by Torres Strait; is the center of a large and important pearl and trepang fishery; and is a depot of trade with New Guinea.

**Thurston, John Mellen,** an American politician; born in Montpelier, Vt., Aug. 21, 1847; was admitted to the bar in 1869; was a delegate to the National Republican Conventions in 1884, 1888, 1892, and 1896; was United States Senator from Nebraska in 1895–1901, and in 1897 rose to special prominence because of his speeches in the Senate advocating prompt intervention on behalf of Cuba. He was also a United States commissioner at the St. Louis Exposition in 1901.

**Thurston, Robert Henry,** an American educator; born in Providence, R. I., Oct. 25, 1839; was graduated at Brown University in 1859; worked in his father's shops in 1859–1861; was an assistant engineer in the navy in 1861–1865; Assistant Professor of Natural Philosophy at the United States Naval Academy in 1865–1871; Professor of Mechanical Engineering at Stevens Institute of Technology in 1871-1885; and in 1885 was made director of Sibley College at Cornell University. He was also president of the American Society of Mechanical Engineers; vice-president of the American Institute of Mining Engineers, and of the American Association for the Advancement

of Science; United States Commissioner to the Vienna Exposition in 1873; a member of numerous United States and State commissions; and the inventor of several testing machines, engine governors and other devices. His publications include "Friction and Lubrication," "Materials of Engineering," "History of the Steam Engine," "Manual of the Steam Boiler." He died in Ithaca, N. Y., Oct. 25, 1903.

THUSNELDA.

**Thusnelda,** the wife of the German hero ARMINIUS (*q. v.*). She was taken prisoner by Germanicus and was led in chains in his triumphal procession on his return to Rome. See ARMINIUS, TRIUMPH.

**Thwaites, Reuben Gold,** an American historian; born in Dorchester, Mass., May 15, 1853. After a high school training he pursued by self instruction a collegiate course and took the post-graduate studies at Yale University in 1874–1875; was managing editor of the "Wisconsin State Journal," Madison, in 1876–1886. In the latter year he became secretary of the State Historical Society of Wisconsin. His publications include: "Historic Waterways" (1888); "The Story of Wisconsin" (1890); "The Colonies, 1492-1750" (1891); "Afloat on the Ohio" (1897); "Stories of the Badger State" (1900); "History of the University of Wisconsin" (1900); "Father Marquette" (1902); "Daniel Boone" (1902); "George Rogers Clark" (1903); and "France in America" (1905). He also edited the "Wisconsin Historical Collections" (vols. ix.-xvii., 1888-1905); "Chronicles of Border Warfare" (1895); and "The Jesuit Relations" (73 vols. 1896-1901); etc.

**Thwing, Charles Burton,** an American educator; born in Theresa, N. Y., March 4, 1860; was graduated at the Northwestern University in 1888, taught physics at the Academy of the Northwestern University in 1888-1893, and studied at the University of Bonn in 1893-1894. He was instructor of physics at the University of Wisconsin in 1894-1896, professor of physics at Knox College, 1896-1901, and in 1901 became professor of physics at Syracuse University. His works include: "An Elementary Physics"; "Color Photography by Lippman's Process"; "Relation Between Specific Inductive Capacity and Chemical Constitution;" etc.

**Thwing, Charles Franklin,** an American educator; born in New Sharon, Me., Nov. 9, 1853; was graduated at Harvard University in 1876, and at Andover Theological Seminary in 1879; pastor of Congregational churches in 1879-1890. In the latter year he accepted the presidency of the Western Reserve University and Adelbert College. His works include: "American Colleges" (1878); "The Reading of Books" (1883); "The Working Church" (1888); "Within College Walls" (1893); "The College Woman" (1894); "The American College in American Life" (1897); "American College Administration" (1900); "History of the Higher Education in America" (1906); etc.

**Thyestes.** See ATREUS.

**Thylacine,** in zoölogy, *Thylacinus cynocephalus,* found in Tasmania, the largest predaceous marsupial living. It is a little smaller than a wolf, dog-like in form; head elongated, muzzle pointed, ears moderate, erect, triangular; color grayish-brown, with a series of transverse black bands on the hinder part of the back and loins; fur short and closely applied to the skin; tail of moderate length, thick at the base and tapering toward the apex, clothed with short hair. These animals are semi-plantigrade, walking partly on the toes and partly on the soles of the feet. They are very destructive to sheep, and settlers have almost exterminated them in the more populated parts of the island. Called also tiger wolf, zebra wolf, and Tasmanian wolf or hyena.

**Thylacinus,** in zoölogy, a genus of *Dasyuridæ* (in classifications in which that family is subdivided, of *Dasyurinæ*), with one living species (see THYLACINE), from Tasmania, though recent fragments of bones and teeth show that an allied species formerly inhabited the mainland of Australia. The marsupial bones are represented only by small unossified fibro-cartilages, and the pouch (traces of which are more obvious in the male than in other marsupials), unlike that of the kangaroos, opens backward. The female produces four young at a birth.

**Thylacoleo,** in palæontology, an extinct genus of marsupials from the post-Tertiary deposits of Australia, with one species, *T. carnifex,* of which nothing but the skull is known. The dentition is very anomalous, the functional teeth being reduced to one pair of large cutting incisors, close to the median line, and one great, trenchant, compressed premolar. It was first described as

a carnivorous marsupial, and named in accordance with its presumed habits, "as one of the fellest and most destructive of predatory beasts" but, as its affinities are certainly with the *Phalangistidæ* and *Macropodidæ*, and its dentition completely unlike that of any known predaceous animal, this view has been questioned.

**Thymallus,** in ichthyology, a genus of *Salmonidæ* group *Salvelini*, allied to *Coregonus*, from which it is principally distinguished by its rayed dorsal fin. There are five species, inhabiting clear streams of the N. of Europe, Asia, and North America, of which the best known are *T. signifer*, the *Poisson bleu* of the Canadian voyageurs, and *T. vulgaris*, the grayling.

**Thyme.** See THYMUS.

**Thymeid,** $C_{24}H_{34}O_4$; a product of the action of sunshine operating for several days on thymoïl contained in a sealed tube. It is obtained pure by mixing equal weights of thymoïl and thymoloïl in alcoholic solution, which then assumes a blood-red color, and deposits crystals which have a greenish metallic luster.

**Thymela,** in Greek antiquity, an elevation, in the form of an altar, in the center of the orchestra of a Greek theater, on which the leader of the chorus stood.

**Thymelaceæ,** or **Thymeleæ,** in botany, daphnads; an order of perigynous exogens, alliance Daphnales. Stem shrubby, rarely herbaceous, with a tenacious bark. Leaves exstipulate, entire. Flowers capitate or spiked, terminal, or axillary, often inclosed in an involucre. Calyx tubular, colored, the limb four or five-cleft; corolla wanting, or reduced to scale-like petals on the orifice of the calyx. Stamens eight, four, or two; style one; stigma undivided; ovary one-celled, with a single pendulous ovule; fruit hard, dry, nut-like or drupaceous. Found in South America, the Cape of Good Hope, and Australia, the cooler parts of India, and in Europe. The bark is caustic. Known genera 38; species 300.

**Thymele,** in entomology, a genus of *Hesperidæ*. Antennæ short, not terminating in a hook; hinder margin of the fore wings rounded; wings dark, with checkered spots, fringes checkered. The larva feeds on the raspberry. Found in moist places. Other species are from tropical America, etc.

**Thymeleaceæ,** the Daphne family, an order of exogenous plants, consisting of shrubs or small trees, rarely herbs, with non-articulated, sometimes spiny branches, with tenacious bark. The leaves are alternate and opposite, and the flowers spiked and terminal. The fruit is nut-like or drupaceous. The species are not common in Europe, they are found chiefly in the cooler parts of India and South America, at the Cape of Good Hope, and in Australia. See DAPHNE.

**Thymene,** $C_{10}H_{16}$; a hydrocarbon belonging to the camphene group, constituting the most volatile portion of oil of garden thyme. By repeated distillation it is obtained as a colorless oil, having an agreeable odor of thyme, sp. gr. .868 at 20°, boiling at 160–165°, and deflecting the plane of polarization to the left.

**Thyme Oil,** in chemistry, a volatile oil obtained by distilling garden thyme with water. It is colorless in the fresh state, has a pleasant pungent odor and camphorous taste, sp. gr.=.87–.90, sparingly soluble in water, easily in alcohol and ether, and turns the plane of polarization to the left, It contains at least two hydrocarbons: Thymene, $C_{10}H_{16}$, and cymene, $C_{10}H_{14}$, and an oxygenated product, thymol, $C_{10}H_{14}O$. In pharmacy, it is a powerful stimulant, which may be used in toothache if applied by lint or cotton. Mixed with olive oil or spirit and camphor, it is a stimulating liniment in chronic rheumatism, sprains, bruises, etc.

**Thymic Asthma,** a disease so named because it was formerly supposed to be connected with a morbid condition of the thymis gland. It is also known as laryngismus stridulus, spasmodic or false croup.

**Thymol,** in chemistry, $C_{10}H_{13}HO$, thymylic hydrate, thymylic alcohol, thymylic acid, thymic acid; the oxygenated constituent of thyme oil and a homologue of phenol, obtained from thyme oil by fractional distillation, passing over chiefly between 225° and 235°. Purified by recrystallization from alcohol, it is obtained in transparent rhomboidal plates. It has a mild odor and aromatic taste, a sp. gr. = 1.0285 in the solid state, and does not act on polarized light, melts at 44°, and boils at about 230°. It is almost insoluble in water, soluble in alcohol, ether, and strong acetic acid, and forms several substitution derivatives by the action of bromine or chlorine in the presence of sunshine. Thymol is an antiseptic and disinfectant, and is largely employed in the Listerian system.

**Thymoil,** $C_{12}H_{16}O_2$; obtained by distilling thymol in presence of sulphuric acid and manganic peroxide. It comes over as a yellow oil, which may be purified by crystallization from ether-alcohol. It forms reddish-yellow four-sided shining laminæ, having an aromatic odor. It is heavier than water, only sparingly soluble in alcohol, melts at 48°, and boils at about 235°.

**Thymoilamide,** $C_{12}H_{15}(NH_2)O$; formed by the action of dry ammonia gas on fused thymoil. It is obtained as a dark red uncrystallizable mass, hard and brittle, but softens at 100°, so that it may be drawn into threads. It is soluble in alcohol.

**Thymoilic Acid,** $C_{48}H_{62}O_{19}$; the product of the oxidation of thymoïl by the action of the air in presence of potash. The potassium salt of the acid which is formed is exhausted with alcohol and decomposed with hydrochloric acid. The acid is then obtained in dingy yellow uncrystallizable flocks sparingly soluble in water.

**Thymoilol,** $C_{12}H_{18}O_2$; a substance obtained by exposing thymoïl contained in a sealed tube to the action of sunshine for a period of several days. Recrystallized from alcohol, it is obtained in small, four-sided prisms, which are inodorous and tasteless, dissolve sparingly in water, easily in alcohol and ether, melt at 145°, and distill without decomposition at 290°.

**Thymotic Acid,** $C_{11}H_{14}O_3 = C_{10}H_{14}O \cdot CO_2$; thymylcarbonic acid; prepared by heating thymol with sodium in a flask through which a stream of carbonic anhydride is passed, thymyl carbonate and thymotate of sodium being formed. From the latter hydrochloric acid throws down thymotic acid in colorless flocks. It is purified by distillation with water, and is obtained as a white, loosely-coherent, crystalline mass with silky luster. It is nearly insoluble in cold water, melts at 120°, dissolves in ferric chloride with fine blue color, the same color being immediately produced in its neutral solutions.

**Thymotide,** $C_{11}H_{12}O_2$; produced by the action of pentachloride phosphorus on thymotic acid. It crystallizes from alcohol in white microscopic needles, which melt at 187°.

**Thymus,** thyme; a genus of *Origanidæ*. Small, often hoary, much-branched, highly-aromatic shrubs. Leaves small, entire, often with revolute margins; flowers whorled or capitate; calyx with 10 to 13 ribs, tubular, two-lipped, the upper lip three-toothed, the lower one bifid, the throat hairy; corolla with the upper lip erect, nearly plane, the lower one patent and trifid; stamens diverging, anther cells at first nearly parallel, afterward diverging; the connective, subtriangular, small nuts nearly smooth. Known species 40, from the temperate parts of the Eastern Hemisphere. The lemon or lemon-scented thyme (*T. citriodorus*) is a variety of *T. serpyllum*, cultivated in gardens for its agreeable smell. *T. chamædrys*, formerly regarded as distinct, is now placed under it as a sub-species. It is used in India in diseases of the eyes and stomach, and on the Chenab as a vermifuge. *T. vulgaris* is garden thyme. It is a small much-branched shrub, a native of the S. countries of Europe, from Portugal to Greece. It is a pungent aromatic, much used in cookery.

**Thymus Gland,** in anatomy, an elongated, glandular-like body, with two lobes which touch each other, situated partly in the thorax, partly in the lower region of the neck. It reaches its greatest size at about the second year of life, then ceases to grow, and finally dwindles into a mere vestige. It is supposed to be in some way connected with the elaboration of the blood in infancy. Its name refers to its resemblance to the flowers of thyme.

**Thymyl Sulphuric Acid,** $C_{10}H_{14}HSO_4$; sulphothymic acid; formed by the action of oil of vitriol on thymol. Its aqueous solution evaporated in a vacuum crystallizes in translucent pearly tables or prisms, which are very soluble in water. With bases it forms a series of crystalline compounds.

**Thynnichthys,** in ichthyology, a genus of *Cyprinidæ*, group Cyprinina, with three species, from the East Indies. Specimens have been found in the Miocene.

**Thynnus,** in ichthyology, a genus of *Scombridæ*, with several species, ranging over tropical and temperate seas. First dorsal continuous, spines feeble; from six to nine finlets behind the dorsal and anal; scales of pectoral crowded, forming a corselet; a longitudinal keel on each side of the tail. Not uncommon in Eocene and Miocene formations. In entomology, a genus of *Thynnidæ*.

**Thyreopterinæ,** in entomology, a subfamily of *Truncatipennæ*. They seek their prey on or under the bark of trees where small insects abound.

**Thyro-hyoid,** in anatomy, of or belonging to the hyoid bone and the thyroid axis. The thyro-hyoid arch in embryology is the third of the branchial arches, or pharyngeal plates. It is related to the formation of the lower or great cornua and the body of the hyoid bone, and corresponds with the first true branchial arch of amphibia and fishes.

**Thyroid Body,** or **Gland,** in anatomy, a soft, reddish and highly-vascular organ, consisting of two lateral lobes united by their lower ends by a transverse portion called the isthmus. It forms a rounded projection upon the trachea and the larynx. It is one of the vascular glands, or glands without ducts. Careful researches show that it has an important relation with the functions of the brain. The removal of the gland causes loss of mental vigor. Goiter is a disease of this gland, and in extreme cases, extirpation is resorted to.

**Thyroid Cartilages,** in anatomy, two flat lateral plates, continuous in front, forming a narrow angle like the letter V. In the male it is called Adam's apple.

**Thyroptera,** in zoölogy, a genus of *Vespertilionidæ*, forming a separate group of that family. Muzzle elongated, slender; crown cone considerably elevated above the forehead; nasal apertures circular; ears funnel-shaped; bases of the thumbs and soles of the feet with highly specialized

organs in the shape of hollow suctorial disks. There is but one species, *T. tricolor*, from Brazil. It is a small bat, with moderately long, dense fur, reddish-brown above and below, except breast and abdomen, which are pale yellowish white.

**Thyrsacanthus,** in botany, a genus of *Gendarusseæ*; tropical American shrubs or herbs, with large leaves and a long raceme of fascicled or cymose flowers.

**Thyrsites,** in ichthyology, a genus of *Trichiuridæ*, with several species from tropical and sub-tropical seas. Body rather elongate, for the most part naked; first dorsal continuous, the spines are of moderate length, and extend on to the second; from two to six finlets behind the dorsal and anal; several strong teeth in jaws, and teeth on palatine bones. The species attain a length of from four to five feet, and are esteemed as food fishes.

**Thyrsus,** in classical antiquities, one of the most common attributes or emblems of Bacchus and his followers. It consisted often of a spear or staff wrapped with ivy and vine branches or of a lance having the iron part thrust into a pine cone. In ancient representations it appeared in various forms. Thyrsi were carried by the Bacchanals in their hands, when celebrating the orgies of Bacchus. In botany, a kind of inflorescence consisting of a panicle, the principal diameter of which is in the middle between the base and the apex; a compact panicle, the lower branches of which are shorter than those in the middle. It is at first centripetal and afterward centrifugal; example, the lilac.

**Thysanoptera,** or **Physapoda,** an order of insects of limited extent, represented by *Thrips*. These insects differ from *Hemiptera*, with which they are often associated, in having maxilliary and labial palpi. The wings are often without veins, and are fringed; the feet are swollen at the end, hence the name *Physapoda*, "bladder-footed," given to the group. The genus *Thrips* and its allies injure wheat, onions, etc., by puncturing the leaves. They are minute insects, with active nymphs (larvæ and pupæ).

**Thysanura,** an order of wingless insects of small size, which undergo no metamorphoses. They are furnished with peculiar organs, either along their sides or at the extremity of the abdomen, which, as well as the legs, are used for locomotion. The two families of most importance are *Poduridæ*, or spring-tails, and *Lepismidæ*. The *Lepismidæ* have an elongated body, covered with small, shining, silvery scales. It has at its extremity a compressed appendage of two pieces, and three jointed bristles, which are used in leaping.

**Thysanuriform,** in entomology, of or belonging to, or resembling the *Thysanura*. Used by Swainson of a certain type of caterpillars, having the head armed with distinct spines, forming a crest round its hinder part, or divided into two hornlike points; the extremity of the body also terminating in two pointed processes. Examples, the larvæ of the large *Nymphalidæ* of tropical America, *Hipparchiæ*, etc.

**Tiara,** the head covering of the ancient Persians; the crown of the ancient Persian kings. These alone had the privilege of wearing the tiara erect; the nobility and priests wore it depressed, or turned down on the fore side. Its form is described variously by different authors, so that it must have varied at different periods. According to Xenophon it was encompassed with the diadem, at least on ceremonial occasions. Also the triple crown worn by the Pope on certain occasions as a sign of his temporal power, of which it is a badge, as the keys are of his spiritual jurisdiction. Nicholas I. (858–867) is said to have been the first to unite the princely crown with the miter, though the Bollandists think this was done before his time. The common statement that Boniface VIII. (about 1300) added the second is incorrect, for Hefele shows that Innocent III. is represented wearing the second crown, in a painting older than the time of Boniface. Urban V. (1362–1370) is supposed to have added the third crown. In its present form the tiara consists of a high cap of cloth of gold, encircled by three coronets, and surmounted by a mound and cross of gold; on each side is a pendant, embroidered and fringed at the end, and powdered with crosses of gold. The tiara is placed on the Pope's head at his coronation by the second cardinal deacon in the loggia of St. Peter's, with the words: "Receive the tiara adorned with three crowns, and know that thou art Father of princes and kings, Ruler of the World, and Vicar of our Saviour Jesus Christ. Also, a crown, a diadem.

**Tiarella,** a genus of plants, order *Saxifragaceæ*, *T. cordifolia*, the miterwort, gem fruit, or cool wort, is found in rocky woods, from Canada to Pennsylvania. Its leaves are cordate, acutely lobed; its scape racemose; its stolons are creeping; and its flowers white, with minute bracts.

**Tiaridium,** in botany, a genus of *Heliotropeæ*, akin to *Heliotropium*, but having the tube of the corolla angular, and two-celled, miter-shaped nuts. *T. indicum* is an astringent, and is used to cleanse ulcers or allay inflammation.

**Tiaris,** in ornithology, a genus of *Fringillidæ* with one species, from Brazil. Bill conical, entire; head crested; wings moderate; tail even or slightly rounded; feet

moderate. In zoölogy, a genus of *Agamidæ*, with three species, from the islands of the Eastern Peninsula. Scales of the body keeled, those of the back unequal; eyebrow and parotids unarmed.

**Tibballs, William Huntington,** an American educator; born in Union, N. J., Dec. 22, 1848; was graduated at Oberlin College in 1875; had charge of city schools in Ohio, Michigan, and Wisconsin for many years; Professor of Philosophy and Literature in Parks College for six years; held the same chair at Salt Lake College for three years; and was president of the Utah State Christian Endeavor Union in 1897–1898. He conducted extensive mining operations, and contributed to literary and educational magazines.

**Tiber** (Italian, Tevere; Latin, Tiberis), the chief river of Central Italy, and the most famous in the peninsula. It rises in a dell of the Tuscan Apennines (province Arezzo), about 11 miles N. of the village of Pieve Santo Stefano. Its course till it reaches Perugia is S. S. E.; thence, as far as Rome, it pursues, along an irregular zigzag line, a S. direction; but when it enters the plain of the Campagna it curves S. S. W., and enters the Mediterranean by two branches, which enclose the Isola Sacra, or Sacred Isle. Of these the N., the Fiumicino, alone is navigable; the Fiumara is silted up with sand. The entire course of the river is about 260 miles — only 145 direct from source to sea. The most celebrated towns on or near its banks are Perugia, Orvieto, Rome, and Ostia; and its chief affluents are the Nera with the Velino and Teverone or Aniene (Anio) from the left, and the Paglia with the Chiana from the right. In its upper course it is rapid and turbid, and of difficult navigation. It is navigable for boats of 50 tons to the confluence of the Nera, 100 miles from its mouth, and small steamers ascend to within 7 miles of that point. The Tiber is supplied mainly by turbid mountain torrents, whence its liability to sudden overflowing of its banks; even the oldest Roman myth, that of Romulus, being inseparably associated with an inundation. Its waters, too, are still discolored with yellow mud, as when Vergil described it.

**Tiberias. Sea of.** See GALILEE. SEA OF.

**Tiberius, Claudius Nero Cæsar,** a Roman emperor; born Nov. 16, 42 B. C.; was the son of Tiberius Claudius Nero and Livia Drusilla, who became the wife of Octavianus Cæsar in 38 B. C. Tiberius and his brother Drusus were brought up in the household of their stepfather, who from the year 27 B. C. was the Emperor Augustus. They were early initiated into public affairs, and in 16–15 B. C., at the head of a Roman army, subdued the Rhaeti and Vindelici. Tiberius now returned to Rome to celebrate his first triumph, and in 13 B. C. was appointed consul together with P. Quintilius Varus. Meanwhile, Drusus carried on the war in Germany with great success, but died in 9 B. C., in consequence of a fall from his horse. Tiberius hastened to Germany, and, after having carried his brother's body to Rome, returned and prosecuted the war with great vigor. In 7 B. C., having led his army across the Rhine into the

FATHER TIBER.

country already half conquered by Drusus, he returned to Rome, becoming consul for the second time, and celebrating his triumph in the same year. In 12 B. C. he had been compelled by Augustus to divorce his wife, Vipsania Agrippina, and become the third husband of his infamous daughter Julia; but, disgusted by her profligacy, and by Augustus having appointed as his successors Caius and Lucius Cæsar, her two sons by her second husband, Marcus Vipsanius Agrippa, he voluntarily retired to Rhodes in 6 B. C., where he passed seven years in seclusion.

He returned to Rome A. D. 2, in which year Lucius Cæsar died in Massilia, on his way to Spain, while his brother Caius died

TIBERIUS.

a year and a half later in the East from a wound which he had received in the Parthian war. Tiberius was accordingly adopted by Augustus as his successor in A. D. 4. In the same year he led an army into Germany, marched to the Elbe, and defeated the Sigambri, Bructeri, and Cherusci. The suppression of a revolt in Pannonia and Dalmatia procured for him the honor of a third triumph. He was now sent once more against the Germans, who, under their great chief Arminius, had cut off Quintilius Varus, with three legions. Accompanied by the young Germanicus, he crossed the Rhine, and during the years A. D. 11 and 12 traversed the countries E. of that river. On the death of Augustus, in 14, Tiberius became emperor. He was in his 55th year, and, though beloved by none, he was much respected for the dignity of his demeanor and the reputed severity of his virtue. For



some years he affected to take no active part in public affairs, while he gradually destroyed the last remnants of the ancient republic, abolishing the "comitia," and transferring the election of public officers to the subservient senate. Augustus had employed the "Lex Julia Majestatis" to punish the authors of libels against his person, and Tiberius, following his example, established the "Judicia Majestatis," for the trial of persons suspected of having, in word or deed, impugned the majesty of the emperor. The number of "delatores," or public denouncers daily increased, while every citizen moved in an air of anxiety and suspicion.

After the death of Germanicus in 19, not without suspicion of poisoning, Tiberius strove less to conceal his hidden vices, while the servility of the senate, and the irritation of pasquinades and continual discoveries of plots, deepened the gloom of his suspicion. In his 67th year he retired to the island of Capreæ to enjoy seclusion, leaving to Ælius Sejanus, commander of the Prætorian guards, the direction of public affairs. Blinded by the misrepresentations of Sejanus, he agreed to every measure which the latter felt to be conducive to his own ambition, and a long and uniform series of cruelties followed. Awakened at last to the ambitious schemes of his favorite, Tiberius ordered the senate to condemn Sejanus, and the latter, with his family and friends, was put to death in 31. Some time after this, Tiberius took up his residence at Misenum, where, as at Capreæ, he plunged himself into the most disgusting debauchery. On March 16, A. D. 37, he fell into a lethargy, and being believed to be dead, Caligula was proclaimed emperor. Tiberius, however, recovered, but he was suffocated in his bed by Macro, to save himself and the young emperor. The elaborate picture of the emperor given in the first six books of the "Annals of Tacitus," can hardly be considered a fair representation of his character. The historian, as an admirer of the old republic, had a strong bias which impelled him to take the worst view, and he has himself confessed that he drew his accounts from poisoned sources. The history of Tiberius, he tells us, "was falsified, while he reigned, through terror, and written after his death with the irritation of a recent hatred." That Tiberius was a brave and skillful soldier and a careful financier cannot be doubted; while, however, unpopular at Rome, he was regarded by the provincials as a wise and beneficient ruler. Perhaps a taint of the insanity which was characteristic of the Claudian house, and a vein of superstition and fatalism, go far to explain many of the acts of "atrocious villany and revolting depravity," which disgraced his later years.

**Tiberius Constantine,** called also TIBERIUS II., one the most virtuous emperors of Constantinople, was a native of Thrace, and was brought up at the court of Justinian. He succeeded to the throne in 578, and having suppressed the conspiracy of Sophia, widow of his predecessor, reigned unchallenged till his death, in 582.

**Tibesti,** a region of the Eastern Sahara, supporting a scanty population of the Tibbu race.

**Tibet,** a dependency of the Chinese Empire, in Central Asia, between China and India; area, about 463,200 square miles; pop. about 6,500,000. The native name is Bod or Bodyul. Tibet is enclosed by the Kuenlun and the Himalaya Mountains. These chains run E. from a mountain knot at the S. extremity of the Pamir highland, and continue to diverge from each other till they reach the meridian of Lassa, when they draw slightly nearer to the E. and S. E., where Tibet is bounded by ranges which separate it from China and Indo-China.

*Topography.*— Tibet is the loftiest region of such extent on the globe. Its table-lands vary in height from 17,000 to 10,000 feet. It has been estimated that their average height is that of the summit of Mont Blanc; The table-lands are loftiest in the W. and N., whence they slope gradually to the S. and E. Bonvalot certified to the existence of volcanoes. The lowest lands in Tibet are the grooves in which the Indus runs W. and the Sanpo E. to the bends where they turn to the S., cross the Himalayas, and descend into India. The mountain girdle which surrounds Tibet has made it an obstacle across which conquerors from Mongolia could not enter India without making a long detour. Another consequence of these barriers has been that Tibet has remained to the present day the region of the globe least known to geographers.

*Provinces.*— Tibet is divided into provinces equal in extent to European States. There are (1) Chaidam (Tsaidam), a name sometimes given to the country between the Nanling and Alten-tagh chains and the Kuenlun. It includes the Koko-Nur lake and the Chaidan marsh, and its cold and scanty pastures are frequented by nomads, among whom is the Tibetan race known as the Tanguts. (2) Katchi, also described as the great N. plain, a lofty region of steppes very little known, but crossed by a road from Kiria in Turkestan, and leading to the gold fields of Thok-Jalung, one of the highest inhabited spots on the globe. (3) East Nari, including Khorsum and Dokthol, an elevated Himalyan country in which the Indus and Sanpo take their rise. It is a country of pastures with a few cultivated tracts. In it is the Lake Manasarowar, surface 15,000 feet high, a sheet of water sacred alike to Tibetans and Hindus. (4) West Nari, or Little Tibet, consisting of Ladakh and Balti, now dependencies of Kashmir (Indian empire). (5) Yu-tsang, composed of the provinces of Yu and Tsang. It includes the valley of the Sanpo between the meridians of 87° and 92°, the most populous and important part of Tibet. The Sanpo becomes navigable at Janglache — elevation 13,600 feet. Yu-tsang is traversed by a well-frequented road from E. to W. The capital of Yu is Lassa; that of Tsang, Shigatze. (6) Kham, the province drained by the upper courses of the great rivers of China, and Indo-China, which run in deep valleys, making it difficult to cross the country. Two great roads traverse Kham, connecting Lassa with Darchiendo (Tachien-lu), the emporium of Chinese trade with Tibet. The shortest and official road passes through Litang (13,400 feet and Batang (8,150 feet) on the Yang-tze river, and Chiamdo, the capital of Kham, on the Mekhong, and over lofty passes into Lassa. The commercial road crosses the rivers higher up where the watercourses are less difficult and there is an abundance of pasture. Near Darchiendo the country seems to be independent alike of China and Tibet, and farther W. is Darge, a district described as rich and flourishing. Chiamdo and other parts of Kham are under the direct rule of China.

*Climate and Agriculture.*— Tibet lies in the latitudes of Delhi, Cairo, Algiers, and Naples, but its inland position and elevation give it a cold, dry, and extreme climate. On the table-lands at an elevation of 14,000 feet the thermometer in May sinks to 7° F. below zero, and over the whole country an arctic winter prevails for five or six months. Owing to the dryness of the air it loses its conductivity, and the inhabitants, dressed in sheepskins, give out long electric sparks on approaching conducting substances. Flesh exposed to the air does not putrefy, but dries and can be reduced to powder. There is a very short but excessively hot summer, more especially in the valleys of the Indus and Sanpo, where the high temperature is more oppressive to Europeans than that of the Indian plains. The N. and W. table-lands are without trees. They abound in steppes, in which pasture herds of wild animals — yaks, horses, asses, goats, antelopes, etc. The pastures of the S. table-lands supply food to the flocks and herds of a large nomad population. Agriculture is confined chiefly to the valleys of the Indus and Sanpo, the grain chiefly grown being barley; the kitchen herbs and fruits of Europe are also cultivated. Irrigation and terrace cultivation are necessary to secure even scanty crops.

*Minerals.*— The mineral products of Tibet are of high value, and include gold, silver, iron, copper, zinc, mercury, cobalt, borax,

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salt, sulphur, etc., but few mines are yet developed.

*Industries and Commerce.*— The Tibetans are good blacksmiths and cutlers; their chief industrial occupation, however, is the preparation of woolen cloth. They are active traders, and large caravans, in which yaks and sheep are the beasts of burden, are constantly traversing the country on their way to the great fairs in Tibet, and the entrepôts of the surrounding countries. Lassa is the chief mart, and here are found silk, carpets, tea and hardware from China; leather goods and livestock from Mongolia; rice, tobacco, sugar, pearls, coral, etc., from the S. At one time there was a busy commerce with India, but since Tibet became a Chinese dependency the passes have been closed. In 1894, Yatung on the frontier of India was opened by treaty as a trade mart and the Chinese and Indian governments each stationed an official at that post. The most important commerce is in the hands of rich Tibetan and Chinese traders, who jealously watch anything likely to interfere with the existing great routes. Of the distribution of population in Tibet little is known. The most densely peopled part of the country is certainly the basin of the Sanpo, in which are the towns of Shigatze and Lassa.

*Ethnology, etc.*— The Tibetans are a Mongolic race, much more closely allied to the Burmese than to the Chinese or Mongols proper. They are broad-shouldered and muscular, and have Mongol features, but not in an exaggerated form. They are said to be intelligent, but without initiative. The Tibetans by race people nearly the whole of Tibet. A few nomads, Mongols and Turkish tribes, have penetrated into the N. steppes, and Chinese in large numbers have colonized the S. E. In Tibet polyandry is practised, the husbands of one wife being generally brothers. This form of marriage is almost universal among the poor. The rich are polygamists. Both systems check population. In Little Tibet, where monogamy has penetrated from the W., population increases rapidly.

*Religion and Literature.*— There exist in Tibet two religions: (1) the Bon or Bon-Pa creed, which is a development of Mongol Shamanism, and is the native religion; and (2) Lamaism, a form of the Buddhism introduced from India. The Tibetan clergy are very numerous, there being, it is estimated, one monk for every family. The Tibetan language as spoken differs much from the old written language; it has been losing its monosyllabic character. Books abound in Tibet, and every monastery has its library. The literature consists chiefly of translations from the Sanskrit, and of religious works. The art of engraving by wooden blocks has for centuries been used by the Tibetans.

*Government.*— Since 1720 Tibet has been a dependency of China, which, however, interferes only with foreign and military affairs. There are two imperial Chinese residents or Ambans at Lassa. Civil and religious government are left to the Tibetan clergy. In theory supreme rule is in the hands of the Dalai Lama, the sovereign pontiff, who resides at Lassa. The Tesho or Bogdo Lama, who has an inferior spiritual power, resides at Shigatze. The Dalai Lama hands over the active duties of government to the de-sri or king, who rules with the assistance of four ministers.

*History.*— The earliest date in Tibetan history which can be relied on as historical is A. D. 639, when the King Sbrong-tsan-Sgam-po introduced Buddhism from India, and founded Lassa. His dominions extended from the Himalayas N. to the Koko-Nur Lake. In the Middle Ages down to the 10th century the Tibetan country is said in the Chinese annals to have extended to the Gulf of Bengal, then described as the Tibetan Sea. In the 9th century a war broke out with China which terminated in 821, when bilingual tablets still existing were erected at Lassa. In 1071 Eastern Tibet was broken up into small States, opening the country to Chinese and Mongol invasion. Kublai Khan, who annexed Tibet to his vast empire, called to his court a Tibetan monk, Phagspa. The latter converted his patron and the Mongols to Buddhism, and the sovereignty of Tibet was conferred on the Dalai Lamas. In 1720 the Chinese, after many struggles, finally conquered Tibet. Seven years later Batang and other parts of Kham were detached from Tibet, and incorporated with the Chinese province of Szechuen. Early in the 18th century Lamas, under the guidance and instruction of Jesuit missionaries, carried out a survey of the Tibetan part of the Chinese empire. From the information supplied, D'Anville, in 1733, prepared a map of Tibet. In 1840 Ladakh was conquered by the Maharajah of Kashmir, and now is a British dependency. In 1854 there was a struggle between Tibet and Nepal which ended in a treaty by which both countries recognized the suzerainty of China.

Eleven years later, in consequence of the refusal of the Tibetan authorities to allow Europeans to enter their country, a system was organized by Major Montgomerie, of the Indian government, in the interest of science, by which pundits or educated Indians were sent as explorers into Tibet. By this means the old maps were corrected and much valuable geographical knowledge was obtained. Prejevalski and other Russian explorers have done for Northern Tibet what the pundits have done for the South. Among other explorers and travelers, may be mentioned Marco Polo, who made Tibet known to Europe in the 13th century, Bogle and Turner sent out by Warren Hastings in

the 18th century; and in the 19th, Manning, Captain Strachey, the Jesuits Huc and Gabet, Bower, the brothers Schlagintweit, Miss Taylor, Dr. Sven Hedin and A. H. Savage Landor.

Sikkim, a frontier State through which passes an important route from India into Tibet, became a British dependency in 1850. In 1888 it was attacked by a Tibetan force, and, as the Chinese government declined and probably was unable to interfere, the invaders were punished by the Anglo-Indian troops. The question was finally settled in March, 1890. The Chinese disavowed the war and recalled their Ambah from Lassa. Britain retained her possessions. In 1889–1890 the journey of M. Bonvalot and Prince Henri d'Orleans across Central Asia from Kuldja to Tonking attracted the attention of French politicians and English merchants; but the practical efforts of the French to open a route to the Mekong river signally failed. In 1904 a military expedition started from India for Tibet to enforce demands for trade facilities. The mission met with much opposition, but succeeded in executing a convention favorable to British interests, to which China agreed in 1906. In 1907 Great Britain and Russia agreed not to enter into negotiations with Tibet except through the Chinese Government, nor to send representatives to Lhasa. In 1908 negotiations to conclude trade relations between India and Tibet were satisfactorily completed, and, the Tibetans having paid an indemnity of £166,666, the British began the evacuation of the Chumbi valley. All hindrances to the development of Indian trade in Tibet were then believed to have been removed.

**Tibia,** the shin bone, with the exception of the femur, the longest bone in the skeleton. It is the anterior and inner of the two bones of the leg, and alone communicates the weight of the trunk to the foot. It is slightly twisted, and articulates with the femur, fibula, and astragalus. Its superior extremity is thick and expanded, with two condylar surfaces supporting the femur, and an external and an internal tuberosity; the shaft is three-sided, the inner surface convex and subcutaneous; the inferior is smaller than the superior extremity, and forms a thick process called the internal malleolus. The tibia corresponds with the radius of the arm. In entomology, the fourth joint of the leg. In music, a kind of pipe, a common musical instrument among the Greeks and Romans. It had holes at proper intervals, and was furnished with a mouthpiece, the performer in blowing putting the end of it to his mouth. Two such pipes were often blown simultaneously by the same performer, one mouthpiece serving for both.

**Tibullus, Albius,** a Roman elegiac poet; born presumably in Gabii, about 54 B. C. His prænomen and parentage are unknown, though he was certainly born to a considerable estate, much reduced, however, in the subsequent confiscations by which Octavian and Antony rewarded their legionaries. His father seems to have died early, but his mother and sister survived him. While still a youth he acquired the friendship of the orator, poet, and statesman, M. Valerius Messala, head of a literary coterie only less attractive than that of Mæcenas. As literature was a direct passport to office under government, and the already marked poetic gifts of Tibullus procured him a place on the staff of Messala commissioned by Augustus, 30 B. C., to crush a revolt in Aquitania. In this campaign the poet displayed capacity enough to win him distinction and decorations, but these could not countervail his repugnance to a soldier's life. Accordingly the close of the war found him dividing his time between the society of Rome and the retirement of Pedum at the base of the Tusculan and Sabine hills. He fell in love with Plania, whose husband was on service in Cilicia. Under the sobriquet of Delia she is the heroine of his first book of elegies, but his devotion did not survive the deception she practised on him, finding as he did that he was not her only lover. It was during the earlier period of this attachment that, at Messala's instance, he started with that statesman on a mission to Asia; but, having sickened on the voyage he went no farther than Corcyra. In his second book of elegies Delia is replaced by Nemesis — this innamorata being a fashionable courtesan, with many other admirers besides Tibullus, who bemoans his bondage to her and stigmatizes her rapacity, but yet cannot bring himself to drop her.

ALBIUS TIBULLUS.

Tibullus died in 19 B. C., immediately after Vergil, universally deplored in Rome, and years afterward the subject of a magnificent elegy by Ovid. Doubt has been thrown on his identity with the Albius of Horace, but we are loth to part with the picture that poet gives of him, pacing pensively his woodland walks at Pedum,

blessed with fortune, with personal beauty, and with all the capacities of refined enjoyment. His character, amiable, generous, loyal to his friends, and constant to the mistresses who deceived him, but wanting in strength and energy, is reflected in his poems, which, "most musical, most melancholy," by their limpid clearness and their unaffected finish still justify Quintilian in placing him at the head of Roman elegy properly so called. Grace, tenderness, pathos, conveyed in verse smooth without monotony, can, however, only abate, not remove, the impression he leaves of lack of the dramatic force characteristic of Propertius or of the masterly range commanded by Ovid. The third book can hardly, even in part, be considered as his, while the fourth, also by another hand, is yet memorable for the 11 poems on the loves of Sulpicia and Cerinthus — Sulpicia's being unique as specimens of a Roman lady's passionate outburst in verse.

**Tiby, Paul Alexandre** (tib-ē′), a French miscellaneous writer; born in Paris in 1800. He wrote: "Memoirs of a Young Priest, Collected and Published by a Layman" (1824); "Statistical Accounts of the French Colonies" (1837); "Two Convents in Mediæval Times: the Abbey of St. Gildas and the Paraclete in the Time of Abelard and Heloise" (1851). He died in Paris, May 10, 1871.

**Tic Douloureux,** a painful affection of a facial nerve, a species of neuralgia. It is characterized by acute pain, attended with convulsive twitchings of the muscles, and continuing from a few minutes to several hours. It occurs on one side of the face, and may be caused by a diseased tooth, by inflammation in the ear passage, by exposure to cold, by dyspepsia, etc. The removal of a tooth, warm applications, the employment of electric currents over the nerve, or morphia administered subcutaneously, are sometimes efficient.

**Tichborne Trial,** a famous conspiracy case in the legal records of England, in which Arthur Orton, generally known as Thomas Castro, an Australian butcher, claimed to be heir to the Tichborne estates. Of the three sons of Sir Thomas Tichborne, the eldest, Roger Charles, died at sea in 1854; the second succeeded his father and died in 1866, and the youngest was acknowledged heir. Lady Tichborne, doubting her eldest son's death, advertised for him, and Castro succeeded in convincing her of his identity with Roger Charles. She died before the trial to recover property had begun. This occurred in 1871, and Castro was nonsuited. He was charged with perjury, proved guilty, and sentenced (Feb. 28, 1874) to 14 years of penal servitude. The first trial last 103 days, and the second 188.

**Tichodroma,** in ornithology, the wall-creeper; a genus of *Certhiidæ,* with one species, ranging from Southern Europe to Abyssinia, Nepal, and the N. of China. Bill slightly curved, nostrils with membranous scale. Wings long and rounded; tail rounded, tip of feathers soft.

**Tichorhine,** in palæontology, the English translation of the specific name of the woolly rhinoceros (*R. tichorinus*), which has reference to the fact that the nostrils are completely separated by a bony septum.

**Ticino** (tē-chē′no; German and French, Tessin), a river of Switzerland and North Italy, which rises in Mount St. Gothard, and after a course of about 120 miles joins the Po on the left. It traverses Lake Maggiore and separates Piedmont from Lombardy.

**Ticino,** a canton in the S. of Switzerland; area, 1,088 square miles. The N. and greater part of this canton is an elevated and mountainous region, the Splügen, St. Bernardin, and Mount St. Gothard forming its N. boundary. The chief river is the Ticino, and there are numerous small lakes. Lake Maggiore is partly within the canton. In the N. the principal occupations are cattle rearing and the preparation of dairy produce. In the S. the olive, vine, figs, citrons, and pomegranates are grown. Manufactures and trade are unimportant. The chief towns are Bellinzona, Locarno, and Lugano.

**Tick,** a popular name for any individual of the family *Ixodidæ.* They abound in almost all parts of the world, but chiefly in warm countries. Many of them live in woods, on the branches of trees, but ready to attach themselves to animals, which sometimes suffer greatly from their attacks. The quantity of blood drawn from their hosts by these little pests is by no means inconsiderable, for their skin is so distensible that the gorged parasite increases to many times its original bulk. Though generally confined to some particular species or group of animals, ticks occasionally attack man.

**Tickell, Thomas,** an English poet; born in Bridekirk, Cumberland, England, in 1686; educated at Queen's College, Oxford, a fellowship of which he held from 1710 till 1726. His complimentary verses on "Rosamond" (in Tonson's "Sixth Miscellany," 1709) gained him the favor, his own virtues the friendship of Addison, who introduced him both into the world of letters and public life, and on becoming in 1717 Secretary of State made him his under-secretary. He held the office of secretary to the Lords Justices of Ireland from about 1725 till his death, at Bath, April 23, 1740. He was skillful and timeous in occasional poetry, as in "The Prospect of

Peace" under Queen Anne, and "The Royal Progress" at the arrival of George I., and he was puffed with all the partiality of affection in the "Spectator." The most memorable incident in his life was his translation of the first book of the "Iliad," about the same time as the first part of Pope's "Homer." Addision declared that the rival versions were both good, but that Tickell's was the best that ever was made. Pope believed, or professed to believe it the work of Addison himself, deliberately prepared to eclipse his version, and wrote in reply the famous satire on Atticus. But there need be no doubt that Tickell made his own translation, though Addison corrected it, as he confessed he did. Tickell's "letter to Avignon," says Johnson, "stands high among party poems; it expresses contempt without coarseness, and superiority without insolence." His longest poem is "Kensington Gardens"; his most popular, the ballad of "Colin and Lucy"; his finest, the exquisite elegy to Addison prefixed to his edition of Addison's Works (4 vols. 1721).

**Ticket-of-Leave,** in English law, a license to a prisoner to be at large before the expiration of the sentence. Originally it was a permit granted to convicts transported to the colonies, but came into use in England after 1840, when the colonies refused to receive more convicts. According to the more recent system introduced in England (1854), the conditions imposed on convicts thus released and on persons under police supervision are:

(1) That they report themselves where directed within 48 hours after liberation.
(2) That they (women excepted) report themselves every month to the police station nearest their place of abode.
(3) That they sleep at the address notified to the police.
(4) That they get their living by honest means and regular employment.
(5) That any change of address must be notified to the police within 48 hours.
(6) That they must produce their license when called on to do so by a police officer.

The penalty for neglecting to comply with these conditions is the forfeiture of the license or 12 months imprisonment with hard labor.

**Ticking,** a strong cloth, commonly made of twilled linen or cotton and of a striped pattern. It is chiefly used for covering mattresses for beds.

**Ticknor, Caroline,** an American author; born in Boston, Mass. She wrote stories and articles published in various magazines; was author of "A Hypocritical Romance and Other Stories" (1896); "Miss Belladonna, a Child of Today" (1897); and was one of the editors of "The International Library of Famous Literature"; "Masterpieces of the World's Literature"; and "The World's Great Orations."

**Ticknor, George,** an American historian; born in Boston, Mass., Aug. 1, 1791. He was graduated at Dartmouth College in 1807, and was admitted to the bar in 1813. In 1815 he embarked for Europe, and visited the chief capitals for the purpose of pursuing his studies. On his return in 1820 he was appointed Professor of Modern Languages and Literature in Harvard University. In 1835 he resigned his professorship, and for the next three years traveled in Europe with his family. In 1849 he published a "History of Spanish Literature" (3 vols. 8vo, New York), corrected and enlarged editions being subsequently published. It was at once recognized by scholars as a work of value, and has been translated into Spanish and German. After some works of minor interest he produced in 1863 "The Life of William Hickling Prescott," the historian, with whom he had maintained a close friendship. He died in Boston, Jan. 26, 1871.

**Ticonderoga,** a village in Essex co., N. Y.; on Lake Champlain, and on the Rutland and the Delaware and Hudson River railroads; 90 miles N. of Albany. Here is the outlet of Lake George which falls 150 feet in 1½ miles and affords excellent water power. It has manufactories of machinery, paint, air engines, graphite, blank books, pulp, paper, etc., and an assessed property valuation of about $800,000. Ticonderoga figured prominently during the Colonial and Revolutionary periods. In 1755 the French erected a fort here and named it Carrillon. Two years later Montcalm started from this place with 9,000 men and captured Fort William Henry on Lake George. In 1758 General Abercrombie endeavored to take the French fort, and was repulsed after losing 2,000 men; but in 1759 it fell into the hands of General Amherst together with Crown Point. Both were then enlarged and strengthened at a heavy expense. In 1775 the works were taken by Ethan Allen while weakly garrisoned. Two years later the fort surrendered to General Burgoyne, and after being dismantled was abandoned. After the war it became a picturesque ruin. Pop. (1890) 2,267; (1900) 1,911.

**Ticorea,** in botany, a genus of *Cusparieæ*. Calyx small, five lobed; corolla funnel-shaped, with a long tube and a five-cleft limb; stamens, five to eight, from two to six of them often sterile; stigma five-lobed, disk cup-shaped, surrounding the ovary. *T. jasminiflora* is a shrub seven or eight feet high, with ternate, stalked leaves, the leaflets lanceolate, corolla white, downy, both with pellucid dots. An infusion of the leaves is drunk in Brazil as a remedy for

frambæsia. *T. febrifuga* has an absorbent stem and contracted panicles, with smaller flowers than in the last. Its very bitter bark is given in Brazil in intermittent fevers.

**Ticpolonga,** in zoölogy, the *Daboia russellii,* Russell's viper, common in the S. of India, Ceylon, and Burma. Length about four feet, individuals from the hill country smaller; grayish-brown, with three series of large, black, white-edged rings, those of the middle series ovate, the outer circular; a yellow line on each side of upper surface of head, both converging on the snout; rostral and labial shields yellow, with brown margins; belly uniformly yellowish, or marbled with brown. Fayrer notes that these snakes vary a good deal in the form and arrangement of the rings and spots, and of the colored patches on the head. It is very deadly, nocturnal in its habits, living on rats, mice, and frogs.

**Ticunas Poison,** a poison used for smearing arrows by the Ticunas and other Indian tribes living near the Amazon. When given to animals it produces strong convulsions lasting for hours. It probably contains picrotoxin, like other poisons used for the same purpose, but it has not been accurately investigated. Woodman and Tidy consider it identical with *Curari.*

**Tidal Air,** the fresh air introduced into the upper part of the lungs by inspiration, as distinguished from the stationary air already in the lungs. The former contains more oxygen and less carbon dioxide than the latter. The tidal air is so called because when it becomes diffused it parts with some of its oxygen, and takes some carbon dioxide from the stationary air.

**Tidal Motor,** a motive power receiving its energy from the action of tidal waters. The most serious difficulty encountered in using the tides is that their action ceases for half an hour or more at each turn of the tide, or once in a little more than six hours, while all manufactories desire a continuous, steady even power for 10 hours daily. It is therefore necessary in constructing tidal motors, to arrange in some way for the accumulation of power during the strong flow of the tide, and maintaining it in reserve for the period of slack water. This is accomplished in numerous ways, the simplest of which is to provide a reservoir into which the water may be pumped during the strong flow of the tide, and used in descending by means of a turbine or other water wheel.

**Tide,** a regular periodic oscillation to which the surface of the sea at any place is subject. The oscillation takes place about twice a day, the periodic time being, on an average, about 12 hours and 26 minutes. Consequently if high tide occurs at noon one day, it will occur next day some 50 minutes later. This is precisely the interval of time which elapses between two successive meridian passages of the moon; and that there must be some connection between the tides and our satellite was early recognized by astronomers. The explanation, however, was lacking till Newton proved them to be a necessary consequence of the law of gravitation. The phenomenon of the tide is, indeed, a case of perturbations, of exactly the same nature as the irregularities which the action of the sun produces on the motions of the moon. If we compare the attraction of the moon on a particle of the earth's surface with the attraction exerted on the earth as a whole, we readily see that, according as the particle is on the nearer or further side of the earth, the former attraction is greater or less than the latter; and it is to this difference of attraction, to which the waters yield, that the whole phenomenon of tide is due. The nearer waters are driven toward the moon, the further waters away from it. If the earth were spherical and uniformly covered with water, the tendency would be to make the water arrange itself in the form of a spheroid with the longer axis pointing toward the moon; and did the earth always present the same face to the moon, this would be rigorously the case.

Such is the equilibrium theory of tides, as originally given by Newton. It accounts so far for the phenomena, such as the simultaneous existence of high water at places diametrically opposite, but does not even approximately correspond to the true state of affairs. Newton was fully aware of this, and indeed has given the solution of the problem on other and truer assumptions. If the hypothetical earth covered uniformly with water is rotating, so as to present each point of its surface successively to the moon, each particle of water will be moving with a certain momentum which will be suffering retardation or acceleration according to its position relatively to the moon. The longer diameter of the water ellipsoid will consequently not point in the direction of the moon; and the result will be the formation of two diametrically opposite waves, flowing round the earth in a direction contrary to its rotation. This is the kinetic theory, which forms the basis of Laplace's theory of tides. It also fails in practical application, since the continuity of the surface waters on the earth is very much broken by the distribution of land.

More recently Young and Airy have approached the question as one of wave motion, basing their theory on the motion of waves in canals. Till now we have been regarding the moon as the sole tide-producing agent, but it is evident that the sun must have a similar action, though not so

marked because of its much greater distance. It was proved by Newton that the disturbing forces exerted by two bodies on the same particle are directly as their masses, and inversely as the cubes of their distances; hence the ratio of the disturbing force exerted by the sun to that exerted by the moon 7:16. The principal tidal wave is that caused by the moon, but on it must be superposed that due to the sun. When the sun and moon are in syzygy, at times of new and full moon, their tidal waves will be superposed crest on crest, and the effect will be what is called a spring tide. When they are in quadrature, trough will coincide with crest, the lunar tide will be partially neutralized by the solar tide, and the result will be the so-called neap tide. The average spring tide will be to the average neap tide as $16 + 7 : 16 - 7 = 23 : 9$.

Besides this effect in amplitude, another effect is caused by this combination of tides, namely the priming and lagging of the tides. For when the two vertices do not coincide, the maximum of the resultant tidal wave will be at a point intermediate to the vertices, so that the time of high water will be now in advance now behind the time it would have been had the moon been the sole agent. Not only, then, are the waters of the ocean subject to diurnal and semi-diurnal oscillations, but these are subject to a monthly, semi-monthly, and even annual variation, besides being more or less affected by prevailing winds and coast configuration. The height of the tidal wave which circulates round the earth is not great — at most some 7 feet, a very small quantity compared to the size of our globe. In estuaries, bays, creeks, straits, etc., however, the difference between high and low water is much greater than this — as much as 50 feet in the Bay of Fundy, Nova Scotia. The explanation of such phenomena is to be found in the momentum with which the water is pushed forward by the advancing wave. In such a sea as the Mediterranean, which is all but cut off from communication with the great oceans, and which is itself not sufficiently extensive to be very perceptibly acted on by the sun and moon, the tides are very small, not exceeding a few inches.

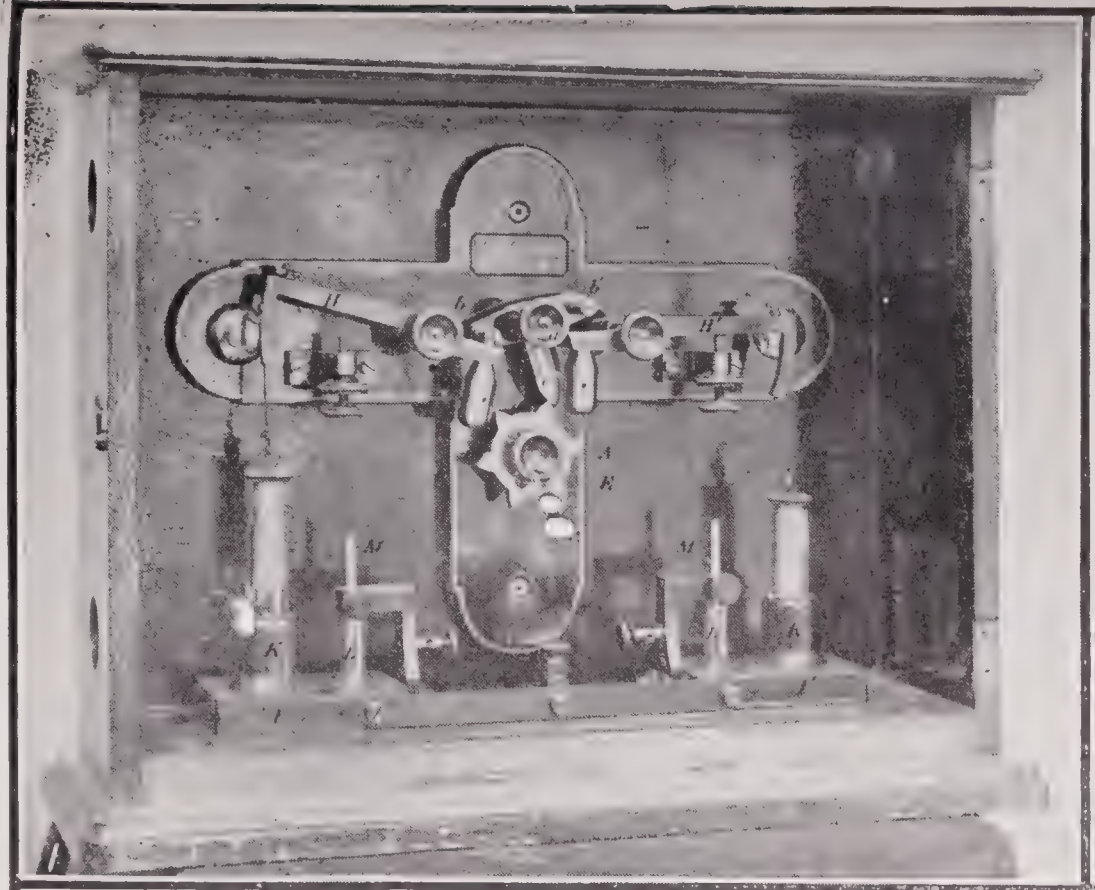
The attempt to establish a complete theory from abstract principles has proved a failure; and the only true method by which to get an insight into the particular laws which govern tidal action at any given place is continued observation. By means of Lord Kelvin's tide gauge a graphical representation of the tidal oscillation at any place can be easily obtained; and by harmonic analysis of the curve, the constituent factors may be easily discovered, and the comparative effects of their several causes estimated. One efficient cause in retarding tides has not been mentioned, namely, fluid friction, which, as first noticed by Kant, must act as a continual brake to the earth in its rotation; and this gradual slackening in the earth's speed of rotation must go on till the day is of the same length as the lunar month, when matters will be as required in the equilibrium theory given above.

**Tide Gauge,** an instrument in harbors to measure the rise and fall of the tides. A common form consists of a graduated spar, 24 feet long, and having boxes at the side, in which is a float with an elevated stem. The spar is secured to a pier or quay, or is anchored in a frame and secured by guys. The rod is ¾ inch in diameter, and is supported by a cork of three inches cube. The stem is guided by staples in the spar.

**Tieck, Ludwig** (tēk), a German writer; born in Berlin, Prussia, May 31, 1773. He was educated at the University of Halle, and at Göttingen and Erlangen, and having returned to Berlin came forward as a writer of tales and romances, including his tale of "Abdallah," and a novel entitled "William Lovell" (three vols. Berlin, 1795 – 1796). His "Peter Lebrecht, a History without Adventures," and "Peter Lebrecht's Popular Tales"; displayed great imaginative power and rich humor. At Jena in 1799–1800 he entered on friendly relations with the Schlegels, Novalis, Brentano, and others, and through this association arose what has been denominated as the Romantic School of Germany. In 1799 he published "Romantic Poems" (2 vols. 1799–1800), and in 1804 appeared his comedy "The Emperor Octavian." His "Phantasus" (three vols. Berlin, 1812–1815), however, gave the first sign of his having freed himself from the mysticism and extravagance of his earlier works. In 1817 he visited England, where he collected material for his Shakespeare; and on his return resided at Ziebingen till 1819, when he removed to Dresden. From this period his writings, as exemplified in his "Tales," bear the true stamp of genius. These tales were ultimately published complete in 12 volumes (Berlin, 1853), the principal being "Dichterleben" (A Poet's Life — Shakes-

LUDWIG TIECK.

INDICATING AND RECORDING THE TIDES.



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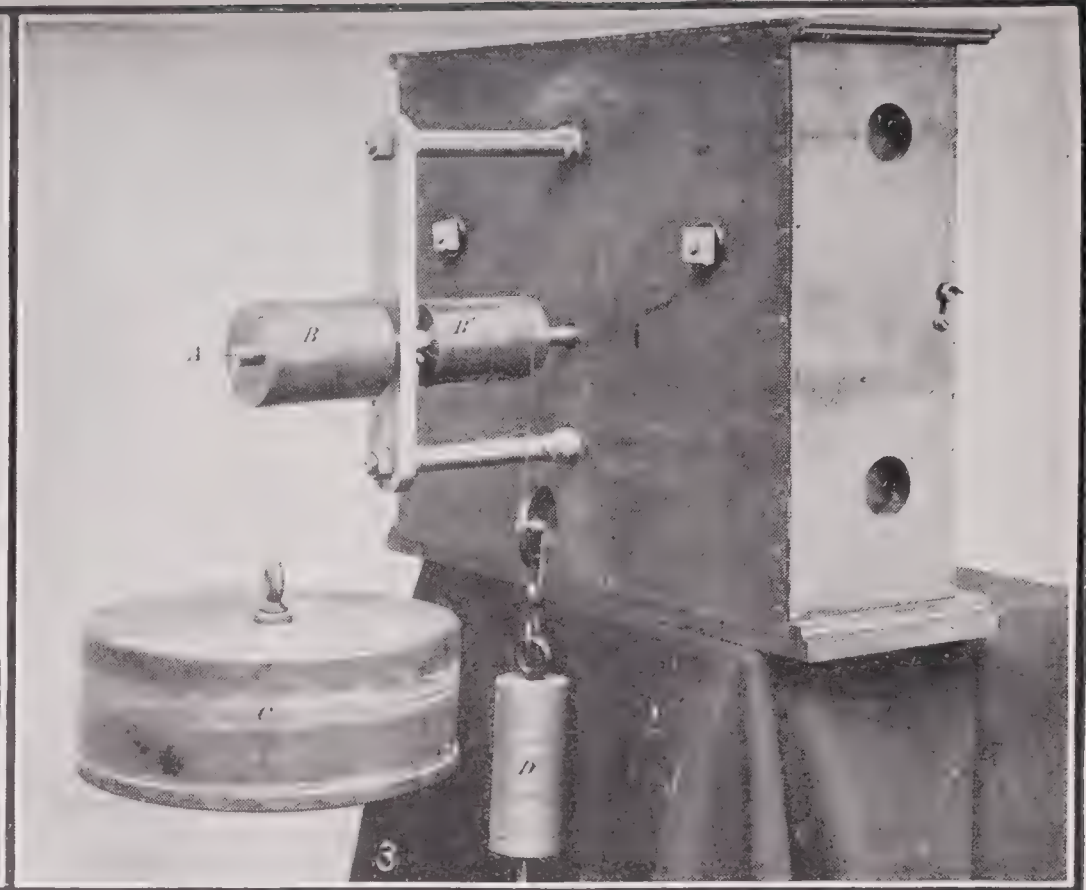

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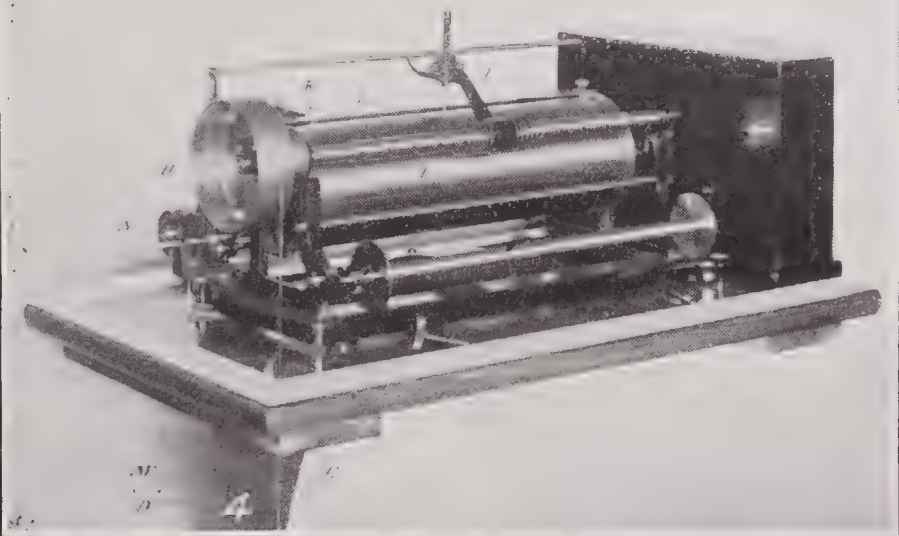

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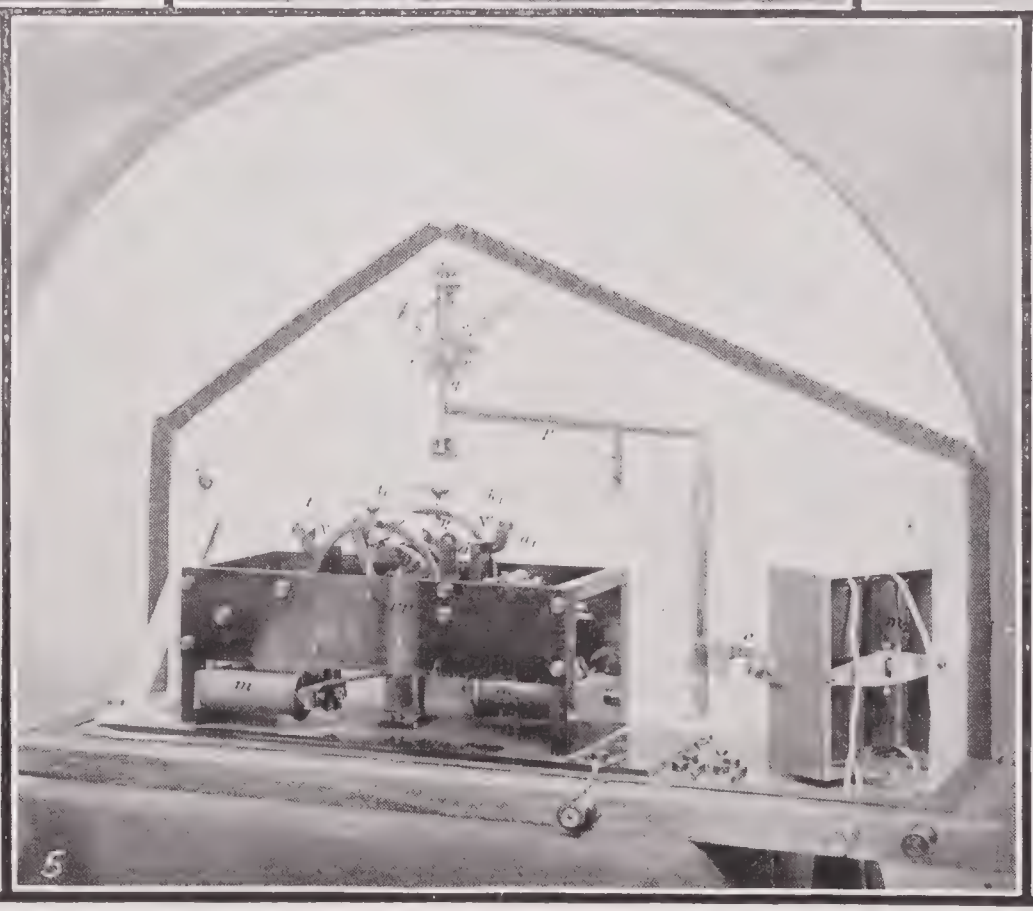

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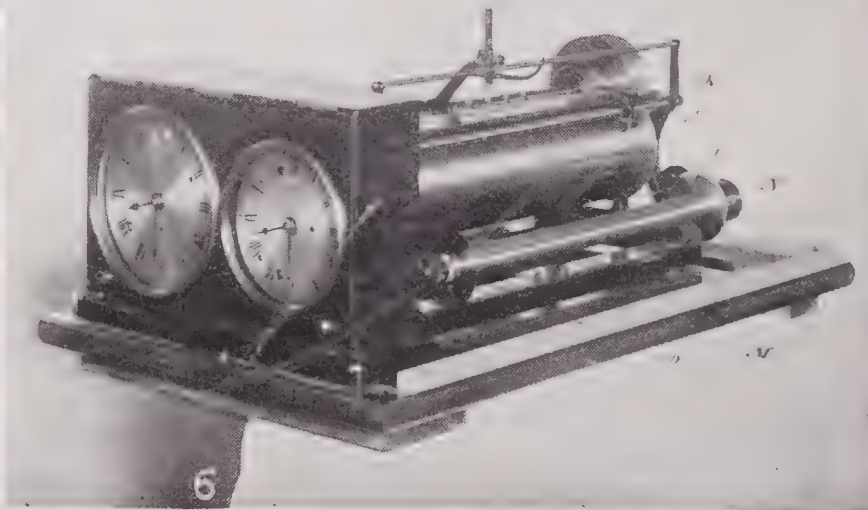

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For description, see other side.

## INDICATING AND RECORDING THE TIDES.

FIG.

1. Interior of Transmitter.
2. Tide Indicator at Fort Hamilton, N. Y.
3. Rear View of Transmitter, Showing Float and Counterpoise Weight.
4. Rear View of Self-registering Tide Gauge.
5. Receiving Instrument.
6. Front View of Tide Gauge.

peare); "Der Tod des Poeten" The Poet's Death—Camoens); the "Witches Sabbath"; and "Aufruhr in den Cevennen" (Revolt in the Cévennes), and incomplete work. In 1826 he published his "Dramaturgic Leaves" (two vols. Breslau). His study of Shakespeare resulted in Shakespeare's "Vorschule" (two vols. Leipsic, 1823-1829); and the continuation of the German translation of Shakespeare commenced by Schlegel. His last story of importance was "Vittoria Accorombona" (1840). On the accession of Friedrich William IV. Tieck was invited to the Prussian court in 1841, invested with a considerable pension and the rank of a privy-councillor, and thenceforward acted as a sort of supervisor of the Prussian stage. He died in Berlin, April 28, 1853. His brother, CHRISTIAN FRIEDRICH (1776-1851), was celebrated as a sculptor.

**Tiedeman, Christopher Gustavus,** an American writer on law; born in Charleston, S. C., July 16, 1857; was graduated at the College of Charleston in 1876; and at the Columbia Law School in 1879; was Professor of Law in the University of Missouri for 10 years and held the same chair in New York University for six years. He was the author of "The Law of Real Property" (1883); "Limitations of Police Powers" (1886); "Commercial Paper" (1889); "Unwritten Constitution of the United States" (1890); "Sales of Personal Property" (1891); "State and Federal Control of Persons and Property" (1900); etc. He died Aug. 25, 1903.

**Tiedemann, Diedrich** (tē'de-män), a German philosopher; born in Bremerwörde, near Bremen, April 3, 1748. He was Professor of Philosophy in the University of Marburg. He wrote: "Researches on the Origin of Languages" (1772); System of the Stoic Philosophy" (1777); "The First Philosophers of Greece" (1780); "Origin of the Magic Arts" (1787); "Spirit of Speculative Philosophy from Thales to Berkeley" (6 vols. 1790-1797): "Theætetus; or, Human Knowledge" (1794). He died in Marburg, Sept. 24, 1803.

**Tiedge, Christoph August** (tēd'gė), a German poet; born in Gardelegen, Prussia, Dec. 14, 1752. He enjoys distinction as the author of "Urania," and "Mirror for Women." He also wrote: "Wanderings through Life's Market" and "Elegies." His admirers are many, and his poetry has been compared with that of Cowper. He died in Dresden, March 8, 1841.

**Tiele, Cornelis Petrus,** a Dutch theologian; born in Leyden, Netherlands, Dec. 16, 1830. He studied at the university there and at the Remonstrants' seminary at Amsterdam, and became Remonstrant pastor at Rotterdam (1856), professor in the seminary translated to Leyden (1873), and Professor of the History of Religions in the University of Leyden in 1877. From its foundation in 1867 he collaborated with Kuenen, Loman, and Ranwenhoff in editing the well-known "Theologisch Tijdschrift;" and he published a long series of important theological works. Of his writings there have been translated into English the "Comparative History of the Egyptian and Mesopotamian Religions" (1869-1872); "Outlines of the History of Religion to the Spread of the Universal Religions" (1876; Eng. trans. by J. E. Carpenter, 1878). Other works discuss the Gospel of St. John as a source of the Life of Jesus (1855), the Religion of Zarathustra (1864), "Babylonian-Assyrian History" (1886-1887); etc.

**Tiemannite,** a massive granular mineral, first found at several localities in the Harz Mountains, but since at several places in the United States; hardness, 2.5; sp. gr., 7.1-7.37; luster, metallic; color, steel to blackish lead-gray. Composition: A selenide of mercury. Dana suggests the formula HgSe, but points out that the analyses mostly correspond with $Hg_6Se_5$, which requires selenium, 24.8, mercury, 75.2 = 100.

**Tientsin** (tē-ent-sēn'), a large city and river port of China, in the province of Chihlî, on the right bank of the Peiho; 34 miles from the mouth of the river. It is the port of the city of Peking, from which it is distant 80 miles S. E. The river is generally frozen over from about Dec. 15 to March 15, and the business at other times carried on by means of boats and junks is taken up by sledges, which swarm on the river. By the treaty of Tientsin, signed here in 1858, the port was declared open; and a British consulate was established in January, 1861, while part of the allied troops were still here. In 1881 Tientsin was connected by telegraph with Shanghai (the line extending to Peking); and there is a railway from Tientsin to the mouth of the Peiho, which will ultimately be extended to Shanghai. The imports have an annual value of $2,000,000 or $2,500,000, the exports about $5,000,000. There is also a large and rapidly increasing transit trade with Russia via Siberia. Pop. estimated at 1,000,000. See BOXERS: CHINA.

**Tiepolo, Giovanni Battista** (tē-ā'pō-lō), an Italian painter, the last of the great Venetian school; born in Venice, Italy, March 5, 1692; modelled himself on Paul Veronese. His first works were in the adornment of churches and palaces in and about Venice; in 1750-1753 he executed a great series of frescoes in the archiepiscopal palace at Würzburg, and in 1760 was engaged on the palace of Madrid. He was a most productive painter, rich in color (especially in his easel pictures), and clear

(though incorrect) in drawing. His chief works were the Old Testament histories—the palace of Udine and the frescoes at Madrid. He died in Madrid, Spain, March 27, 1769. His two sons were also painters, and like their father, etchers also.

**Tiernan, Frances Fisher** (pseudonym, CHRISTIAN REID), an American novelist; born in Salisbury, N. C. Her many works include: "Valerie Aylmer" (1870); "Mabel Lee" (1871); "Morton House" (1871); "Ebb Tide" (1872); "Nina's Atonement" (1873); "Carmen's Inheritance" (1873); "A Daughter of Bohemia" (1873); "A Gentle Belle" (1875); "Hearts and Hands" (1875); "A Question of Honor" (1875); "The Land of the Sky" (1875); "After Many Days" (1877); "Bonny Kate" (1878); "A Summer Idyl" (1878); "Hearts of Steel" (1882); "Armine" (1884); "Roslyn's Fortune" (1885); "Miss Churchill" (1887); "A Child of Mary" (1887); "Philip's Restitution" (1888); "The Land of the Sun"; "A Woman of Fortune"; "Chase of an Heiress"; etc.

**Tierra del Fuego,** an archipelago consisting of a group of several large and numerous small islands, lying off the S. extremity of South America; in lat. 54° S., lon. 70° W.; separated from the continent by the Strait of Magellan. Its extreme S. point is formed by Cape Horn. The principal island, Tierra del Fuego, sometimes known as King Charles South Land, is divided between Chile and Argentine Republic, to the latter of which Staten Island also belongs. All the other islands and islets are included in Chile. The shores of the archipelago are generally much broken by and indented with bays and arms of the sea, with mountains rising abruptly from the water. These fjords, as a rule, contain deep water at their shoreward extremities, with bars, or, more properly, banks at the sea entrances; in this feature, as well as in their scenery, resembling many of the salt water lochs on the W. coast of Scotland.

The whole group is mountainous, the high hills of the mainland (Tierra del Fuego) attaining a height of 7,000 feet, the snow line being at an altitude of 4,000 feet above sea-level. There are some dreary plains and a few fertile river valleys, with areas of marshy ground between Useless and St. Sebastian Bays. None of the rivers are important, unless it be the Juarez Celman, which is believed to be navigable for a considerable distance above its mouth. Toward the N. the plains produce good pasturage, and attempts at sheep farming have been made in the district, the Jesuit missionaries on Dawson Island having a farm with nearly 20,000 sheep and over 6,000 cattle. Forests of beech, winter's bark, magnolia, and cypress cover large areas, with dense growths of such bushes as Berberidæ, Escallonia, *Ribes magellanica*, Embrothrium, *Myrtus mummularia*, and Salicemiæ on the hill slopes. Lichens grow abundantly at greater heights, and cover much of the low grounds, where, apparently, nothing else can flourish. The more common and old-fashioned English garden flowers come to perfection in the settlers' enclosures in the extreme N. Few island groups situated so close to continental land exhibit a poorer fauna than is here presented, the guanaco, tucu-tucu (a small rodent), dog, fox, and rat being the only quadrupeds, with the exception of the lately introduced farm stock. The dog is semi-domesticated, and is kept by the natives in immense numbers. Birds, however, are abundant and various, including *Vanellus cayanus*, *Surnia funerea*, owls, gulls, falcons, and a great variety of sea birds. Seals and sea-lions, once almost innumerable along the shores, have grown scarce and wild, especially in the N. portion.

The land of Tierra del Fuego is rapidly rising, and the coast line has advanced 3 kilometers since the date of the surveys of Captains King (1826-1828) and Fitzroy (1831-1836). The rocks are principally volcanic, but sedimentary strata are not uncommon on the principal island, and probably on some others. Granite, syenite, porphyry, quartz, serpentine, trachite, diorite, and sandstone comprise the principal rocks. Some coal, of a poor description, and a little gold have been found. The situation of the islands exposes them to a series of conditions which render their climate the most tempestuous in the world. The prevailing winds are from the W., beginning to blow with the rise of the sun, and increasing in violence till dusk, when a calm may generally be looked for with confidence. During the short summer the winds blow from the N. Settled weather never lasts for more than a fortnight at a time. December, January and February are the warmest months. March is exceedingly boisterous always, and during its course occur the most destructive gales.

The people are savages of a low type, divided into three tribes, the Onas (or Aonas), the Yaghans, and the Alakalufs, the Yaghans being now supposed to be the aborigines. The Onas are tall, the others short and stunted in stature. The charge of cannibalism once brought against them appears to be unfounded. They number about 8,000.

**Tiers-état** (ti-ār-zā-tä; "third estate"), the name given in the ancient French monarchy to the third order of the nation, which, together with the nobility and clergy,

formed the *états gênêraux* (States-General). It consisted of the deputies of the *bourgeoisie*, that is, the free inhabitants of the towns and communes who did not belong to either of the other two estates. In 1789 the States-General, or rather the *tiers-état* by itself, assumed the name of the National Assembly.

**Tiffany, Charles Comfort,** an American clergyman; born in Baltimore in 1829; was educated at Dickinson College, Andover Theological Seminary, and the Universities of Halle, Heidelberg and Berlin; ordained in the Protestant Episcopal Church in 1866; held charges in Boston and New York in 1867-1890; and became archdeacon of New York in 1893. He wrote "Expressions in Church Architecture"; "Modern Atheism"; "History of the Protestant Episcopal Church"; "The Prayer Book and the Christian Life." He died Aug. 20, 1907.

**Tiffany, Charles Lewis,** an American manufacturer; born in Killingly, Conn., Feb. 15, 1812; was educated at the Normal Academy; removed to New York city in 1837, where with J. B. Young he opened a stationery and fancy goods store, from which the house of Tiffany & Co. grew, with branch houses in London and Paris. Mr. Tiffany was one of the founders of the Union League Club and of the New York Society of Fine Arts, and a member of numerous societies. He died in New York city, Feb. 18, 1902.

**Tiffany, Francis,** an American clergyman; born in Maryland in 1827; was ordained in the Unitarian Church in 1852; pastor in West Newton, Mass., in 1865-1882; wrote: "Life of Dorothea Lynde Dix"; "Bird Bolts"; "Life of Charles Francis Barnard"; "This Goodly Frame, the Earth"; etc. He died Sept. 3, 1908.

**Tiffany, Louis Comfort,** an American artist; born in New York city, Feb. 18, 1848; studied art in New York and Paris; has done considerable decorative work; discovered the "Tiffany Favrile Glass," and some of his designs for stained glass windows have become famous. He was president and art director of the Tiffany Glass and Decorating Company, and a member of many American and foreign art associations.

**Tiffany, Louis McLane,** an American surgeon; born in Baltimore, Md., Oct. 10, 1844; was graduated at the University of Cambridge, England, in 1866, and at the Medical Department of the University of Maryland in 1868, and afterward practised in Maryland. He was at different times demonstrator of anatomy, Professor of Operative Surgery and Professor of Surgery at the University of Maryland.

**Tiffin,** a city and county-seat of Seneca co., O., on the Sandusky river, and on the Pennsylvania, the Cleveland, Cincinnati, Chicago and St. Louis, and the Baltimore and Ohio railroads; 42 miles S. E. of Toledo. Here are Heidelberg University, Ursuline Academy, public library, hospital, St. Francis's Orphans' Home, street railroads, electric lights, National and State banks, and a number of daily, weekly and monthly periodicals. It has manufactories of machinery, wire nails, bent wood, lanterns, agricultural implements, glass, emery wheels, pottery, etc., and an assessed property valuation exceeding $4,000,000. Pop. (1900) 10,989; (1910) 11,894.

**Tiflis,** a province of Asiatic Russia, extending on both sides of the Kur river from the central chain of the Caucasus Mountains on the N. to the Armenian plateau on the S.; area 15,306 square miles. Steppes and fertile plains are found in the center, but much of the surface is mountainous, covered with offshoots from the Caucasus and Mount Ararat, reaching in some peaks to 12,000 feet. The soil is fertile and yields abundant tobacco, cotton, indigo, wheat and fruit. Numerous rich petroleum springs and mineral wells exist, and excellent timber is produced from the extensive forests of oak, elm, maple, and chestnut. Pop. (1908, with Zakataly), 1,117,100.

TIFLIS, the capital of the province, and chief city in the territory of the Caucasus, lies in a narrow valley on both sides of the Kur, 184 miles E. S. E. of Poti by rail. In its architecture and in the manners of its inhabitants the city presents a singular mixture of Asiatic and European features. The city is the seat of the civil and military authorities of Transcaucasia, and has 42 churches (23 Armenian), 2 mosques, a gymnasium, and several upper schools, a library, a botanic garden, a hospital, and a theater. It has active manufactures of woolens, silks, cottons, armor, and leather, and is the emporium for the important Russian trade with Persia. It is already connected with Teheran by telegraph. Pop. (1908) 159,590.

**Tiger,** in zoölogy, the *Felis tigris* (*Tigris regalis, Gray*), the largest and most dangerous of the *Felidæ*, exceeding the lion slightly in size and far surpassing him in destructiveness. It is purely Asiatic in its habitat, but is not by any means confined to the hot plains of India, though there it reaches its highest development both of size and coloration. It is found in the Himalayas at certain seasons, at a high altitude, and in 1887 one was captured near Wladiwostock, in Siberia, and another in the Caucasus, near the Black Sea. It is met with to the E. throughout Chinese Tartary, and as far N., it is said, as the island

of Sakhalin, where the winter is very severe. According to Fayrer, the full-grown male Indian tiger is from 9 to 12 and the tigress from 8 to 10 feet from the nose to the tip of the tail, and from 36 to 42 inches high at the shoulder. It is the only member of the family ornamented with cross stripes on the body—a scarce type of coloration among mammals. These cross stripes help to render the animal inconspicuous among the reeds in which it commonly hides itself, and where it would be seen with comparative ease if marked with spots or longitudinal bands. The ground color of the skin is rufous or tawny yellow, shaded with white on the ventral surface. This is varied with vertical black stripes or elongated ovals and brindlings. On the face and posterior surface of the ears the white markings are peculiarly well developed. The depth of the ground color and the intensity of the black markings vary, according to the age and condition of the animal. In old tigers the ground becomes more tawny, of a lighter shade, and the black markings better defined. The ground coloring is more dusky in young animals.

Though possessed of immense strength and ferocity, the tiger rarely attacks an armed man, unless provoked, though often carrying off women and children. When pressed by hunger or enfeebled by age and incapable of dealing with larger prey, like buffaloes, the tiger prowls around villages, and, having once tasted human flesh, becomes a confirmed man eater. In a government report it is stated that "one tigress caused the desertion of 13 villages, and 250 square miles of country were thrown out of cultivation." The natives destroy tigers by traps, pitfalls, spring guns, and poisoned arrows, but the orthodox method of keeing down their numbers as pursued by Europeans is to employ natives to beat the bush while the game, when started, is shot by the sportsmen seated on elephants. The sport is exciting, but dangerous; for a wounded tiger has been known to spring on an elephant and to inflict serious wounds on the driver and occupants of the howdah, before it could be dispatched. When taken young the tiger is capable of being tamed. The pair of adult animals which were presented to the Zoölogical Society of London by the Guicowar of Baroda, used to be led about by their attendants in the streets of that city; and Sir James Outram once possessed a male which lived at large in his quarters, and occasionally accompanied him in boat excursions. The tiger was known to the ancients; frequent mention of it occurs in both Greek and Latin writers, and like the lion, it was habitually seen in the games of the circus. No reference is made to it, however, in the Bible. The jaguar (*Felis onca*) is sometimes called the American tiger, and *Felis macrocelis*, from the Malayan Peninsula, the clouded tiger.

In sugar making, a tank having a perforated bottom, through which the molasses escapes. Also, a boy in livery whose special duty is to attend on his master while driving out; a young male servant or groom. Colloquially, a kind of growl or screech after cheering; as, three cheers and a tiger.

To buck (or fight) the tiger: to gamble (slang).

**Tiger Beetle,** the *Cincindela campestris*, a species of beetle belonging to the pentamerous section of the order *Coleoptera*. The head is broader than the prothorax, the jaws are long and curved, and the legs are slender. The color is brownish, marked with lighter dots and stripes. The tiger beetle is common in sandy places, and on the shores of rivers and ponds. It runs swiftly, and is difficult to capture. *C. campestris* and *C. vulgaris* are familiar species.

**Tiger Cat,** a name of not very definite signification, sometimes given to some of those animals of the family *Felidæ* which are of middling size, and resemble the tiger in their form or markings, such as the chati, the margay, the ocelot, the serval, etc., which see.

**Tiger Flower** (*Tigridia pavonia*), a Mexican bulbous plant of the natural order *Iridaceæ*, frequently cultivated in gardens on account of the magnificence of its flowers. The stem is about one foot in height, with sword-shaped leaves. The flowers are large, of a singular form, and very evanescent. The petals are of a fine orange-red toward the extremity; whitish or yellowish and beautifully spotted at the base.

**Tiger Lily** (*Lilium tigrinum*), a native of China, common in American gardens, having scarlet flowers turned downward, the perianth being reflexed. It is remarkable for having axillary buds on the stem. The bulbs are eaten in China and Japan.

**Tiger Moth,** the *Arctia caja*, a large fine moth, the male with pectinated antennæ, the fore wings in both sexes brown, with numerous irregularly ramifying whitish streaks and spots, the hinder wings reddish orange with six or seven blue-black spots; expansion of wings, 2¼ to 2¾ inches. Larva black, with long white hairs on the back, reddish-brown ones along the sides and on the anterior segments; the head and legs black. It feeds on chickweed, dock-nettle, and various low plants. The eggs are deposited in July and August; the larva lives through the winter, and when full grown is about two inches long. It spins a loose hairy web in July, and changes to a large dark smooth chrysalis.

**Tiger Shark,** the *Stegostoma tigrinum,* a shark common in the Indian Ocean. Young specimens are generally met with close to the shore; but the full-grown fish, from 10 to 15 feet long, frequent the open sea. The color is a yellowish-brown, with black or dark-brown transverse bands or spots, whence the popular name. Called also zebra shark.

**Tigert, John James,** an American clergyman and author; born in Louisville, Ky., Nov. 25, 1856; was graduated at Vanderbilt University in 1877; Professor of Moral Philosophy there in 1881–1890; became book editor of the Methodist Episcopal Church, South, and editor of the "Methodist Review" in 1894, and bishop in 1906. He was author of "Hand-book of Logic" (1885); "Systematic Theology" (1886); "Theology and Philosophy" (1888); "The Preacher Himself" (1889); "Passing Through the Gates" (1889); "The Making of Methodism" (1898); "Theism" (1901); etc. He died Nov. 21, 1906.

**Tighe, Mary (Blackford),** an Irish poet; born in Dublin, Ireland, in 1773; married her cousin, Henry Tighe, of Woodstock, M. P., in 1793. Though her poem "Psyche, or the Legend of Love," was privately printed (1805), it was only after her death, March 24, 1810, that her writings were given to the world. The first edition was in 1811, and they have been frequently reprinted. The "Psyche" is written in the Spenserian stanza; and at least, by Leigh Hunt's admission, occasionally contains a fancy not unworthy of a pupil of Spenser. Her other poems are short occasional pieces, frequently of a religious cast. It is probably as the subject of Moore's lyric, "I saw thy form in youthful pride," and of Mrs. Hemans's "Grave of a Poetess," that Mrs. Tighe is destined to be longest remembered.

**Tight Lacing.** It has long been recognized that undue compression by the clothes, and particularly by stays, of the waist and lower part of the chest causes disturbances of the relations of the internal organs, and impairs their functions; producing, *e. g.,* distortion of the liver and stomach, breathlessness, impaired digestion and diminished capacity for exertion. More recently it has been maintained that the tendency to various more definite diseases is caused or much aggravated by this condition. Among these may be mentioned certain displacements of the womb, and other diseases peculiar to women; movable kidney, gall-stones, anæmia, and ulcer of the stomach, which are all more common in the female sex than the male. While it cannot be said that the casual relation is definitely established in any of these cases, there are facts in regard to each which render it at least possible that such a relation may exist.

In a case where an injurious effect of any kind is present or is suspected, it is not sufficient merely to discontinue the use of stays, for that would only bring the constricting bands by which the lower garments are usually supported to bear still more directly on the waist. Some arrangement must be made by which the weight of these garments may be borne by the shoulders and bust, either by having each one made with an upper part fitting the chest and shoulders, or by having them attached by buttons or tapes to a stout but not tightly-fitting bodice. It is much to be desired that more attention were paid to the natural conformation of the body, and less to the unreasonable demands of fashion in the matter of dress. See Corset.

**Tigridia,** the tiger flower, a genus of plants, order *Iridaceæ,* containing only one species, *T. pavonia,* distinguished by the three outer segments of the perianth being larger, and by the filaments being united into a long cylinder. It is a native of Mexico, and much cultivated in flower gardens for the singularity and great beauty of its flowers, which are, however, evanescent. The root is a scaly bulb.

**Tigris,** next to the Euphrates, the greatest river of Asiatic Turkey; rises on the S. slope of the Armenian Taurus range in Kurdistan, to the S. of Lake Goljik. It has a sinuous course in a S. E. direction, almost parallel to that of the Euphrates, which river it joins at Kurna, after a course of 1,060 miles. The joint stream, called the Shat-el-Arab, after a further course of 90 miles, enters the head of the Persian Gulf. In its upper course the Tigris flows through fine pasture land, frequented by nomad Kurds and Arabs, and from Diarbekir, where it becomes navigable for small craft, to Mosul, a distance of 200 miles, its banks are highly cultivated in some places. Below this point, again, as far as Bagdad (250 miles), it traverses unpeopled wastes, while from Bagdad to its mouth the steep banks are overgrown with high reeds and brushwood, and are haunted by lions and other beasts of prey. Its affluents, the Bitlis, Great and Little Zab, the Dyala, all flow from the highlands to the N., the country separating it from the Euphrates being a streamless waste. The chief places on the Tigris are Diarbekir, Mosul, and Bagdad, and the ruins of Ninevah, Selucia, Ctesiphon, and Opis. Like the Euphrates, the Tigris rises in spring with the melting of the snow on the Armenian Mountains; and during the latter half of May, when the flood is at its height, the whole country between and beyond these rivers, for over 100 miles between Bagdad and Bussorah, is converted into a lake. The arrowy stream either loses less water by irrigation or receives more from its affluents than the

Euphrates, for it is the larger of the two at the point of confluence.

**Tigrisoma,** in ornithology, a genus of *Ardeidæ,* with four species from tropical America and Western Africa. Bill as in *Ardea;* face and sometimes chin, naked; legs feathered almost to the knees; inner toe rather shorter than outer; claws short, stout, regularly curved; anterior scales reticulate or hexagonal.

**Tikoor,** or **Tikul,** in botany, the *Garcinia pedunculata,* a tall tree, a native of Rungpur, Goalpara and Sylhet in India. The fruit is large, round, smooth and, when ripe, yellow. The fleshy part is of a very sharp, pleasant taste, and is used by the natives for curries, and for acidulating water; if cut into slices it will keep for years, and might be used in lieu of limes, on board ship on long voyages.

**Tikus,** in zoölogy, a small insectivorous mammal, from Malacca and Sumatra, described by Sir Stamford Raffles as *Viverra gymnura,* but now known as *Gymnurus raffiesii.* Externally, it is not unlike an opossum with a lengthened muzzle; greater portion of the body, upper part of legs, root of tail, and stripe over the eye black, the other parts white. It possesses glands which secrete a substance with a strong musky smell.

**Tilden, Douglas,** an American sculptor; born in Chico, Butte co., Cal., May 1, 1860; lost his hearing as a result of scarlet fever and in consequence was educated at the State Institution for the Deaf in Berkeley, Cal., where he was graduated in 1879. Later he took up the study of sculpture and in 1893 was appointed a member of the jury on sculpture at the World's Columbian Exposition in Chicago. He was a member of the National Sculpture Society, the New York Art Club, the San Francisco Art Association, etc., and Professor of Sculpture at the Mark Hopkins Art Institute. His works include "Base-ball Player"; "Tired Boxer"; "Indian Bear Hunt"; "Football Players"; etc.

**Tilden, Samuel Jones,** an American statesman; born in New Lebanon, N. Y., Feb. 9, 1814; was educated at the University of New York; studied law with Benjamin F. Butler, and was admitted to the bar in 1841; began practice in New York city, and became actively interested in politics; was elected to the State Assembly in 1845; and was a delegate to the Constitutional Convention of 1846. His most celebrated cases as a practising lawyer were the contest of the election of Azariah C. Flagg to the comptrollership of New York city; the opposition of the heirs of the murdered Dr. Burdell to a demand by Mrs. Cunningham for a power of administration over his estate, and the defense of the Pennsylvania Coal Company against a demand for the payment of extra tolls to the Delaware and Hudson Canal Company. During the Civil War he maintained that the struggle with the South could be terminated without resorting to acts not warranted by the Federal Constitution. Mr. Tilden became leader of the Democratic party in New York State in 1868, and in that capacity strenuously opposed the corrupt administration of the Tweed faction. In 1874 he was elected governor of New York, and during his term of office broke up the notorious "canal ring." In 1876 he was nominated for the presidency of the National Democratic Convention. In the election Hayes received 4,033,295 popular votes, and Tilden, 4,284,265. In 1877, on the finding of the Electoral Commission, the presidency was awarded to the Republican candidate by an electoral vote of 185 to 184. Mr. Tilden died in "Greystone," his country-seat, near Yonkers, N. Y., Aug. 4, 1886. The bulk of his fortune, which consisted of several million dollars, was bequeathed to trustees to be used for establishing a great public library in New York city, but his will was contested successfully. An heir relinquished her share of the estate and this was the nucleus of the Tilden Foundation of the New York Public Library. See Electoral Commission: Hayes, Rutherford B.: New York Public Library.

**Tile,** a kind of thin slab of baked clay, used for covering roofs, paving floors, lining furnaces or ovens, constructing drains, etc. Tiles, both flat and curved, were in great demand in Roman architecture. Roofs were covered with the flat and curved tiles alternating. Tiles two feet square with a foot at each angle were used to line the thermæ, so that an air space between them and the wall should prevent the absorption of the water by the latter. Tiles are manufactured by a similar process to bricks. Roofing tiles are of two sorts, plain tiles and pantiles; the former are flat, and are usually made ⅝ inch in thickness, 10½ inches long, 6¼ wide. They weigh from 2 to 2½ pounds each, and expose about one-half to the weather; 740 tiles cover 100 superficial feet. They are hung on the lath by two oak pins, inserted into holes made by the molder. Pantiles, first used in Flanders, have a wavy surface, lapping under and being overlapped by adjacent tiles of the same rank. They are made 14½ x 10½; expose 10 inches to the weather; weigh from 5 to 5¼ pounds each; 170 cover 100 superficial feet. Crown, ridge, hip, and valley tiles are semicylindrical, or segments of cylinders, used for the purposes indicated. Siding tiles are used as a substitute for weather boarding. Holes are made in them when molding, and

they are secured to the lath by flat-headed nails. The gauge or exposed face is sometimes indented, to represent courses of brick. Fine mortar is introduced between them when they rest on each other. Siding tiles are sometimes called weather tiles and mathematical tiles; these names are derived from their exposure or markings. They are variously formed, having curved or crenated edges, and various ornaments either raised or encaustic. Dutch tiles, for chimneys, are made of a whitish earth, glazed and painted with various figures. Drain tiles are usually made in the form of an arch, and laid on flat tiles called soles. Paving tiles are usually square and thicker than those used for roofing. Galvanized iron tiles have been introduced in France. They are shaped like pantiles, so that each laps on its neighbor in the course, and each course laps on the one beneath it. In brass founding, the cover of a brass furnace; now made of iron, but formerly a flat tile. In metallurgy, a clay cover for a melting pot. As a slang term, a tall stiff hat; a tall silk hat, or one of that shape.

**Tileston, Mary Wilder,** an American author; born in Salem, Mass., Aug. 20, 1843. She was author of "Quiet Hours" (1874); "Selections from Marcus Aurelius Antoninus" (1876); "Selections from the Imitation of Christ" (1876); "Sursum Corda Hymns of Comfort" (1877); "Sunshine in the Soul" (1877); "Selections from Epictetus" (1877); "Heroic Ballads" (1883); "Daily Strength for Daily Needs" (1883); "Sugar and Spice"; a collection of nursery rhymes (1885); "Prayers Ancient and Modern" (1897); etc.

**Tilestone,** in geology, the uppermost group of the Silurian period, consisting of a reddish, thin-bedded, slightly micaceous sandstone, which in some places attains a thickness of 1,000 feet.

**Tiliaceæ,** the lime tree family, a natural order of polypetalous dicotyledonous plants, consisting chiefly of trees or shrubs, with simple, toothed, alternate leaves, furnished with stipules. The species are generally diffused throughout the tropical and temperate parts of the globe. They have all a mucilaginous wholesome juice, and are remarkable for the toughness of the fibers of their inner bark, which is used for various economical purposes under the name of "bast." Among the most important genera are *Tilia* and *Corchorus,* the former containing the common lime, the latter jute.

**Tilkerodite,** in mineralogy, a variety of clausthalite, differing in the proportions of selenium and lead, and containing over 3 per cent. of cobalt. Occurs with other selenium compounds.

**Till,** in geology, the Lower Bowlder clay; a stiff, stony, unstratified clay produced by the bottom moraine of a great ice sheet. In Scotland it sometimes exceeds a hundred feet thick. It contains layers of peat and terrestrial vegetation, interglacial beds, the latter with bones of the mammoth and the reindeer, with fragments of the Arctic and boreal shells. It proves a submergence of Scotland to 520 feet below its present level. It is of Pleistocene age, and is probably the equivalent of the Lower Shelly Bowlder clay of Lancashire.

**Tillæa** (named after Tilli, an Italian botanist, 1655–1740), a genus of *Crassuleæ.* Calyx three or four parted or lobed; petals three to five, generally distinct, acuminate. Styles short, carpels three to five, ovules one or more, follicles few or many-seeded, constricted in the middle. Known species 20, distribution world-wide.

**Tillandsia,** in botany, a genus of *Bromeliaceæ.* Calyx persistent, divided into three oblong segments, lanceolate at the tip; corolla tubular, longer than the calyx, also divided into three segments; stamens six, with short filaments; ovary superior; stigma obtuse, trifid; fruit a capsule, having three cells with several seeds, each supported by a long stalk of aggregate fibers, which at last becomes a feathery wing. Known species about 30. *T. usneoides* hangs down from the trees in tropical America like long, dry beards. It is used for stuffing birds and in the preparation of an ointment used against hemorrhoids. *T. utriculata,* the wild pine of Jamaica, is another parasite. The stem is three or four feet and the leaves three feet long, with expanded bases, which retain any rain falling upon them; the bases then swell and form a bottle, contracted at the neck, and holding about a quart of water, of which animals and travelers make use during drought. *T. monostachya,* the single-spiked tillandsia, also has reservoirs of water.

**Tillemont, Louis Sébastien le Nain de** (tēy-môn*g*), a French ecclesiastical historian; born in Paris, France, Nov. 30, 1637; had his education from the Port Royalists, and early devoted himself to historical studies. He entered the priesthood in 1676, and after the dispersion of the Solitaires in 1679 spent most of the remainder of his life on his estate at Tillemont. His chief works are the laborious and solid "Ecclesiastical History of the Six First Centuries" (16 vols. 1693–1712) and the "History of the Emperors Who Reigned during the Church's Six First Centuries" (6 vols. 1691–1738). He died in Tillemont, near Paris, Jan. 10, 1698.

**Tiller,** the lever or handle of the helm by which the rudder is turned. See STEERING APPARATUS.

**Tillett, Wilbur Fisk,** an American educator; born in Henderson, N. C., Aug. 25, 1854; was graduated at Randolph Macon College, Va., in 1877; and at the Princeton Theological Seminary in 1880; and was pastor of the Methodist Episcopal Church, South, in Danville, Va., in 1880–1882. He was chaplain and tutor of theology in 1882–1883; adjunct Professor of Systematic Theology in 1883–1884, dean of the Theological Faculty, and vice-chancellor, all in Vanderbilt University. His publications include "Hymn Studies" (1889); "Discussions in Theology" (1890); etc.

**Tillidæ,** in entomology, a family of *Sericornes.* Two at least of the palpi advanced and terminating in a knob; antennæ various; body usually almost cylindrical, with the head and thorax narrower than the abdomen. Chief genera, *Tillus* and *Clerus.* Called by Latreille, *Clerii.*

**Tillier, Antoine de** (tē-yā′), a Swiss historian; born in Bern, Switzerland, in 1792. His works are: "History of the Middle Ages" (4 vols. 1829); "History of the Helvetic Republic, 1798–1848" (11 vols.); "History of the Republic of Bern" (5 vols.). He died in 1854.

**Tillman, Benjamin Ryan,** an American legislator; born in Edgefield co., S. C., Aug. 11, 1847; was educated at Bethany Academy. He became prominent in a discussion for industrial and technical education and other reforms in 1886; founded Clemson Agricultural and Mechanical College, at Fort Hill, for boys, and Winthrop Normal and Industrial College at Rock Hill, for girls, which are the two largest schools of the kind in the South; was elected Democratic governor of South Carolina in 1890 and 1892; was conspicuous in the Constitutional Convention of South Carolina in 1895; and was elected United States Senator in 1895 and 1901. On Feb. 22, 1902, during the consideration of the Philippine Tariff Bill, Senator Tillman and his associate, Senator McLaurin, indulged in a personal encounter, for which the president of the Senate directed that the calling of their names should be omitted, a ruling which he subsequently withdrew in order that the Senate itself might pass on the breach of courtesy. On Feb. 28, both Senators were censured by the Senate for their action. Because of the occurrence in the Senate President Roosevelt withdrew from Senator Tillman an official invitation to meet Prince Henry of Prussia, which act became a source of much severe criticism of the President in certain parts of the South. It was thought that because of these two occurrences the President would decline to visit the Charleston Exposition, but the original invitation of the exposition managers was supplemented by a cordial communication from leading citizens of the city and State urging the President's attendance.

**Tillman, Samuel Escue,** an American military officer; born near Shelbyville, Tenn., Oct. 2, 1847; was graduated at the United States Military Academy and commissioned 2d lieutenant of artillery in 1869; transferred to the Engineer Corps in 1872 as 1st lieutenant; served on frontier duty in Kansas in 1869–1870; was assistant Professor of Chemistry, Mineralogy, and Geology in the Military Academy in 1870–1873 and 1879–1880; assistant Professor of Philosophy in 1875–1876; and Professor of Chemistry, Mineralogy, and Geology after 1880. He was assistant astronomer in the United States expedition to Tasmania to observe the transit of Venus in 1874–1875; and author of "Essential Principles of Chemistry" (1884); "Elementary Mineralogy" (1894); "Descriptive General Chemistry" (1899); "Important Minerals and Rocks" (1900); etc.

**Tillodontia,** in palæontology, a group of fossil Mammals founded by Marsh on remains from the Middle and Lower Eocene of North America. They seem to combine the characters of the *Ungulata, Rodentia,* and *Carnivora.*

**Tillotherium,** a genus of *Tillodontia.* The skull was like that of the *Ursidæ,* the molars were like that of the *Ungulata,* and the large incisors very similar to those of the *Rodentia.* The skeleton resembled that of the *Carnivora,* but the feet were plantigrade, each with five digits, all armed with long, pointed claws.

**Tillotson, John Robert,** Archibishop of Canterbury; born in Sowerby, Yorkshire, England, in October, 1630. He studied at Clare Hall, Cambridge, graduated B. A. in 1650, and became a fellow the year after. The writings of Chillingworth influenced him early, not less the conversation of Cudworth, and others of his school. In 1656 he became tutor in the house of Edmund Prideaux, attorney-general under the Protector. He is said to have received his orders from Sydserf, Bishop of Galloway, and at any rate he was a preacher by 1661, when we find him ranged among the Presbyterians at the Savoy Conference. He submitted at once to the Act of Uniformity (1662) in December of the same year declined Calamy's Church of St. Mary Aldermanbury, London; but in 1663 became rector of Keddington, in Suffolk, the year after preacher at Lincoln's Inn, where his mild, evangelical, but undoctrinal morality was at first little relished — "Since Mr. Tillotson came," said the Benchers, "Jesus Christ has not been preached among us." That same year he married a niece of Oliver Cromwell, and became lecturer at St. Lawrence's Church, in the Jewry. In 1670 he became a pre-

bendary, in 1672 dean, of Canterbury. Along with Burnet he attended Lord Russell on the scaffold (1683).

In 1689 he was appointed clerk of the closet to King William and dean of St. Paul's, and in April, 1691, was raised to the see of Canterbury, vacant by the deposition of the Nonjuror Sancroft. He accepted this elevation with the greatest reluctance, nor could all the insults of the Nonjurors to the end of his life extort either complaint or retaliation from the meek and tolerant primate. His "Posthumous Sermons," edited by his chaplain, Dr. Ralph Barker, filled 14 volumes (1694), and for them the booksellers gave the unwonted sum of 2,500 guineas. A complete edition of his whole works, including 254 sermons, appeared in three volumes folio, 1707–1712; with a good "Life" by Dr. Thomas Birch, 1752; and an annotated selection of his sermons by G. W. Weldon (1886). The judgment of Tillotson's preaching by his contemporaries is thus summed up by Burnet: "He was not only the best preacher of the age, but seemed to have brought preaching to perfection; his sermons were so well heard and liked, and so much read, that all the nation proposed him as a pattern, and studied to copy after him." Dryden used to say that what talent he had for English prose was due to his familiarity with Tillotson, and Locke recommends him as a model of perspicuity and propriety in language. He died Nov. 22, 1694.

**Tilly, Johann Tserklæs, Count von,** one of the most notable generals of the Thirty Years' War; born in the castle of Tilly, Brabant, Belgium, in February, 1559. He was at first educated under Jesuit supervision for the priesthood, but a strong bias toward a military career soon showed itself, and he abandoned the Church for the army. He served under Alva during the revolt in the Netherlands, and afterward with distinction in Hungary. Maximilian, Duke of Bavaria, appointed him commander of his forces, and in 1620, two years after the beginning of the Thirty Years' War, he utterly routed the Bohemians. During the next period of the contest he defeated in turn the two Protestant leaders. In 1622 he drove from the Palatinate Christian, Duke of Brandenburg, and in August next year defeated him in a three days' engagement at Stadtloo in Münsterchen. In 1625 he led the army of the Catholic League against Christian IV., of Denmark, who commanded the army of Lower Saxony, and defeated him in the battle of Lutter. Along with Wallenstein he forced the Danish king to agree to the disgraceful peace of Lübeck (1629). Next year Wallenstein was forced to resign the command of the imperial forces, and Tilly succeeded him. In May, 1631, Tilly sacked with ferocious cruelty the town of Madgeburg. As he himself complacently wrote, since the destruction of Troy and Jerusalem nothing had equalled it. Gustavus Adolphus was too late to save, but not to avenge Madgeburg. In September, 1631, he defeated Tilly at Breitenfeld, and again at Rain on the Lech. In both battles Tilly was wounded. He died in Ingolstadt, April 30, 1632, a few days after his second defeat. Tilly was an able general, but a man of narrow intellect. Not personally ambitious, nor caring for money, he was a fanatical Roman Catholic, ready to sacrifice everything for his Church.

COUNT OF TILLY.

**Tilmatura,** in ornithology, sparkling tails; a genus of *Trochilidæ*, with one species, *T. duponti*, from Guatemala. Wings rather short and somewhat sickle-shaped; tail feathers pointed, the outermost narrow toward the tip, which is curved inward.

**Tilmus,** in pathology, a picking of the bedclothes, through cerebral excitement, toward the conclusion of any serious disease. It is often regarded as a very unfavorable symptom.

**Tilsit,** a town of Prussia, province of East Prussia; at the junction of the Tilse with the Memel or Niemen, which is crossed by a fine railway bridge (1875), 53 miles S. E. of Memel. It has a schloss (built 1537, partially burnt 1876), a fine rathhaus, four churches, two hospitals, a gymnasium (since 1586), a realschule of the first class (1839), and a large barrack. Tilsit manufactures paper, leather, linens, woolens, and beer, has iron founding and sugar refining, and considerable commerce in horses, timber, corn, and produce. The town is historically interesting as the place where, on a raft in the river, the peace of 1807 was concluded between Napoleon, Alex-

ander, and Friedrich Wilhelm III., by which the last was deprived of one-half of his dominions. Pop. (1900) 34,539.

**Tilt Hammer,** a large hammer worked by steam or water power, and used principally in compacting the balls of iron as they come from the puddling furnace, and driving out the dross with which the iron is associated when in the form of pig, and some of which is removed by the reverberating flames of the furnace. It is also used in heavy forging. The ordinary tilt hammer has a cast iron helve, supported at the end on plummer blocks, fixed on wooden beams to ease the jar. The head, of wrought iron faced with steel, passes through an eye in the helve, and is secured by a key. The base of the anvil is of cast iron, and the pane of wrought iron, faced with steel. The head is raised by a series of cams on a cast iron collar, called the cam-ring bag, fixed on the shaft, which is provided with a heavy fly wheel. The hammer has usually a drop of 16 to 24 inches, and strikes 75 to 100 blows per minute. When not in use it is propped up by a support. The power is applied and regulated by the use of a foot treadle running around the bed of the hammer in such a manner that the operator can stand in front or on either side.

**Tilton, Theodore,** an American journalist; born in New York city, Oct. 2, 1835; was graduated at the College of the City of New York; editor of the "Independent" in 1856–1871; founded the "Golden Age," but withdrew from it after two years. He caused a wide sensation in 1874 by charging Henry Ward Beecher with criminal intimacy with his wife, and by suing him for $100,000 damages. The trial resulted in the disagreement of the jury. In 1883 Mr. Tilton settled in Paris, France. His publications include: "The Sexton's Tale, and other Poems" (1867); "Sancta Sanctorum, or Proof-Sheets from an Editor's Table" (1869); "Tempest-Tossed" (1873); "Suabian Stories"; etc. He died May 25, 1907.

**Timacite,** in petrology, a name given by Breithaupt to a felsitic rock inclosing crystals of white felspar, etc. Now shown to belong to the andesites, some being quartz-free, and others grouping with the quartz andesites.

**Timalia,** in ornithology, the type genus of *Timaliinæ*, with 12 species from the Malay Peninsula, Sumatra, Borneo, and Java. Bill with sides much compressed to tip; few short bristles at base; nostrils in small groove, semilunar opening with a small scale; wings fifth to seventh quills longest; tarsi with one long scale in front.

**Timaliidæ,** babbling thrushes; a group of small, strong-legged, active Passerine birds, mostly of dull colors, which are especially characteristic of the Oriental region, in every part of which they abound, while they are much less plentiful in Australia and Africa. The Indo-Chinese sub-region is the headquarters of the family, whence it diminishes rapidly in all directions in variety of both generic and specific forms. Wallace puts the genera at 35 and the species at 240. Other writers extend the limits of the family, which they place under the *Turdiformes*, making the chief characteristic a rounded and concave wing, and divide it into the following sub-families: *Troglodytinæ*, *Brachypodinæ*, *Timaliinæ*, *Cisticolinæ*, and *Miminæ*.

**Timaliinæ,** a sub-family of *Timaliidæ*, approximately equivalent to the family *Timaliidæ* as first described above. Bill moderate, keel curved; nostrils exposed; wings short and rounded; tail graduated; tarsi long and strong; toes long, strong, with large scales above; claws compressed and sharp.

**Timber,** trees cut down, squared, or capable of being squared, into beams, rafters, boards, planks, etc., to be employed in the construction of houses, ships, etc., or in carpentry, joinery, etc. Timber is usually sold by the load. A load of rough or unhewn timber is 40 cubic feet, and a load of squared timber 50 cubic feet, estimated to weigh 2,000 pounds. In the case of planks, deals, etc., the load consists of so many square feet. Thus, a load of one-inch plank is 600 square feet, a load of planks thicker than one inch equals 600 square feet divided by the thickness in inches. The term is often used for all kinds of felled and seasoned wood. It is also a general term for growing trees yielding wood suitable for constructive purposes. The chief are fir, pine, oak, ash, elm, beech, sycamore, walnut, chestnut, mahogany, teak, etc.

In the United States there are 300 species of trees, the smallest of which grows to a height of 30 feet. In South America the number is much greater, and India possesses about 900 species of timber trees. The species in England do not exceed 30, and in France or Germany there are only a few more. Yet, though the kinds of wood are so much more limited in European countries, there are almost as few in general use in the United States as in Europe. The smallness of the number of species of timber known to commerce is at first glance very remarkable, but it is accounted for in this way. The great consumption of timber is for architectural and other constructive works which are usually carried out on a scale of some magnitude, and for such purposes large quantities of the kind or kinds chosen are required. It is very desirable, therefore, that the wood selected should be plentiful, durable, more or less easily worked, fairly uniform in quality, and moderate in price.

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As yet the very useful timbers have been obtained from gregarious species of trees growing in the forests of the N. temperate regions of the globe, and the most important of these are a few kinds of fir and pine. From the tropics, where the social species are fewer, come the harder, heavier, and more richly colored or figured kinds, some of which are used in Europe and North America only for furniture and decorative purposes. Some of these tropical woods are, however, of extraordinary strength, and possess other valuble properties which will bring them sooner or later into use for building purposes. This is all the more certain to be the case as both in North America and in Europe the forest-covered land is being stripped of its best timber at a rapidly increasing rate. Trees are of such slow growth that it takes many years before they are large enough to yield useful timber; so that when the primitive forests of a country are once cut down the keeping up of a supply by planted trees is a very difficult matter.

*Chief Commercial Timbers.*— The following are the best known and most used timbers in Great Britain. Baltic redwood (*Pinus sylvestris*), perhaps the most generally useful of all, is employed for roofing and flooring, and often for all other internal and external wood work of better-class houses and other buildings. It is also used for paving streets and many other purposes. This wood in the cut state is called "yellow deal" in England. American yellow pine (*Pinus strobus*), called white pine in its native country, is also very largely imported for the internal joiner work of buildings, parts of furniture, etc., but it is not suited for external work. Like the last, it is an excellent and easily worked timber. Baltic white wood (*Abies excelsa*) has for a considerable number of years taken the place of redwood for joists, flooring boards, roof timbers, etc. It is a distinctly inferior wood. American pitch pine (*Pinus rigida*), found over a large extent of country in the Eastern States, is an important timber. It has been much used in England for open roofs and for the whole of the wood-fittings of churches, halls, and the like. The annual rings of this wood are strongly marked, so that its planed surface looks striped. It is a heavy and highly resinous, but not very easily worked wood. The Douglas or Oregon pine (*A. Douglasii* or *Pseudotsuga Douglasii*) of Northwestern America, between 200 and 300 feet in height, yields a timber of great length without knots, suitable for masts, spars, and many other purposes.

Under the name of Californian redwood, the timber of *Sequoia sempervirens* has of late years been to some extent imported into Great Britain. Like the last, the tree is of great size, and the wood is easily got free of knots. It is of a pleasing red color (most of the so-called red pine woods are nearly white), and easily worked in the longitudinal direction, but difficult to cut clean across the grain. Another recently imported wood is the Kauri pine of New Zealand. The Kauri (*Dammara australis*) is also a majestic tree, and the wood is highly prized for all general purposes in its native country. It seems to have some tendency to warp, but this may be owing to defective seasoning. We may mention among coniferous woods that of the deodar (*Cedrus Deodara*), which, though not used in Great Britain, is extremely durable, and of great importance in Northern India.

Among the more important American coniferous timbers, some of which have been already referred to, are the white pine (*Pinus strobus*), called in England yellow pine; the yellow pine of the Eastern States (*Pinus mitis*); the hemlock; the black spruce; the Douglas pine; Californian redwood; the white cedar (*Chamæcyparis thyoides*); the red cedar (*Juniperus virginiana*); as well as the larch or tamarack (*Larix americana*).

Of timbers from dicotyledonous or, as they are sometimes called foliaceous trees oak is the most important. The oak timber grown in the N. of Europe is obtained from two or three varieties of one species of Quercus, or from distinct but closely allied species. The timber possesses in a high degree the useful properties of a hardwood. It is strong, tough, elastic, and not too heavy. Its sp. gr. averages about .800. Few woods are more durable or less affected in exposed situations by alternations of wet and dry weather. It is still used largely in shipbuilding and for many purposes in civil architecture, but for the latter it is much more expensive than pine wood. Oak has the defect of rusting iron which pierces it or which is in contact with it. One or two American oaks also yield valuable timber. Teak, from an Indian tree, is next in importance to oak as a constructive timber. It has just the opposite effect on iron, as it protects the metal from rust, a property which gives it great value as a backing for the armor plating of ships. Teak is neither quite so hard nor so strong as oak, but it is as difficult to cut with tools, and it is rather lighter when thoroughly seasoned. Besides its extensive use in shipbuilding, it has been of late years used for external architectural work. Elm, though of much less consequence than oak as building timber, is nevertheless a good deal employed for engineering purposes; it is also used in shipbuilding for keels and other parts under water. Elm is only of great durability if kept either quite dry or constantly wet. For other timbers belonging to the same great class of trees, such as ash, beech, hornbeam, sycamore, lime, and birch, which have more restricted applications, see their respective

heads. In the S. of Europe the timbers of the chestnut (*Castanea vesca*) and the walnut are extensively used.

There are a few exceptionally remarkable timbers, which may just be named. Greenheart, which is of extraordinary strength, is believed to contain some principle which resists the attacks of boring worms when used for piles. Sabicu (*Lysiloma sabicu*), which is plentiful in Cuba, is another immensely strong wood. Both these timbers are heavier than water, and are used in shipbuilding. The Jarrah wood (*Eucalyptus marginata*) of Western Australia is believed to be extremely durable for sleepers and paving blocks. Recently a few of the streets of London have been paved with it. Lignum vitæ (*Guaiacum officinale*) is of all woods the one which comes nearest to a strong metal in resistance to tear and wear.

*Furniture and Ornamental Woods.*— Mahogany is by far the most important of furniture woods, and it has many minor applications as well. Perhaps no other timber has such valuable properties for the construction of cabinets, sideboards, tables, or casing of any sort. For a hardwood it is easily worked; it is close-grained, takes a fine polish, and is very durable; if well seasoned it is not apt to warp, shrink, or crack, and its color improves with age. Some pieces of finely "curled" or figured mahogany bring a very high price. Oak, though also an excellent wood for furniture, is more difficult to season, more laborious to work, and less easy to obtain free of defects. The black walnut (*Juglans nigra*) of Canada and the United States is much used for furniture. It is of a pleasing dark color, and comes nearer Spanish mahogany in suitability for cabinet work, but is not so hard. Italian or Circassian walnut (*Juglans regia*) is harder, and as a rule much more richly figured. It has been used for centuries for carving and furniture in Italy and other European countries. Much old walnut furniture is badly "worm eaten." Brazilian rosewood, the product of a much smaller tree than any of the above, is a strong, hard, heavy material, but fairly easily worked. It is of a dark, rich brown color, with beautiful streaks and cloud-like markings of a still darker tint, which more nearly resembles those of a colored marble than any other known wood. It has been long used in Europe for costly furniture. Satinwood, of which there are two kinds much the same in appearance, is something like rosewood in hardness and fineness of grain. Owing to their closeness of grain neither holds glue well. Except that it is of a different and much lighter color, the figure of satinwood much resembles the "curl" of mahogany.

Ebony is another of the costly cabinet woods which is also hard and heavy. It is particularly close in the grain, so that it is suitable for drawing instruments as well as for cabinets, caskets, and the like. Ebony is black or nearly black in color, and has been prized for making furniture with ivory and other "inlays" from ancient Egyptian times. Beautiful work of this kind is still made in Paris. The strikingly mottled Calamander wood of Ceylon and the fine marble wood of the Andaman Islands are both from ebenaceous trees. Among the very beautiful and for the most part costly woods used only for veneering and inlaying furniture and small ornamental articles are tulip wood (*Physocalymma florida*), snake or letter wood (*Brosinum aubletii*), purple heart (*Copaifera Martii*), and zebra wood (*Connarus guianensis*) from the tropical parts of America; to which may be added Amboyna wood from Singapore. Bird's-eye maple, a beautifully spotted or "eyed" light wood, is used in its native country (North America) for furniture, and was formerly much in favor for this purpose in England. In the S. of Europe the wood of the olive and of the orange are used for cabinet work. In Australia some species of acacia, such as black wood (*A. melanoxylon*) and myall-wood (*A. homalophylla*), which are dark woods, the former, especially, often beautifully figured, are used for furniture; so also are several other woods, including forest oak (*Casuarina torulosa*), muskwood (*Olearia argophylla*), and cypress pine (*Frenela robusta*), a Queensland tree. Of late years, under the name of African mahogany, the botanical source of which is still uncertain, a wood somewhat resembling ordinary mahogany has been imported in some quantity into England from the coast of Guinea, and seems to be coming into favor for some kinds of cabinet work.

*Nature of Wood.*— The stem or trunk of an ordinary exogenous tree consists of a central pith and rings or zones of fibro-vascular bundles (composed of numerous cell forms) through which medullary rays radiate. In a growing tree of this class the new wood forms next the bark, and is called sap-wood (alburnum). Gradual changes occur in these annual rings or layers of new wood as they become older, and in time, which varies from one to many years, they get hardened or solidified into ripe wood or heart wood (duramen), of which all useful timber consists. These changes are of a chemical and physical character, and, although it is the hardening of the wood of a growing tree with age that gives it its technical value, yet the change is, physiologically, an incipient process of degradation which ends in decomposition. It is only in a few kinds of trees, however, that the decay of the wood is rapid. This duramen or heartwood, when properly treated after felling, is generally of a lasting nature, and in the hardwoods especially is usually of a darker color than the sap wood; but in some pine woods the

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sap wood, soon after the tree is cut down, gets darker than the heart wood, and is of a bluish or greenish color.

The properties of wood depend partly on the mode of union of the fibers, and partly on the constituents, such as gum, resin, tannic acid, etc., which occur in the cellular and intercellular spaces. But there is also a small proportion of nitrogenous constituents which set up a kind of fermentation in damp wood, and especially in young spongy wood, exposed to the air, and are the cause of its decay. In other circumstances, however, even in the presence of moisture, but where the access of oxygen is prevented, some kinds of wood will keep for an enormous length of time. Pieces of wood have been taken out of the lignite beds of the newer geological formations which are scarcely distinguishable from sound timber recently cut. The timber used in the construction of a house or other building should be thoroughly dried before being put in, and air allowed to circulate about it. This is especially necessary with regard to joists and flooring near the surface of the ground, otherwise damp and want of ventilation will render them peculiarly liable to be attacked by dry rot.

The apparent sp. gr. of wood varies from 0.383 (poplar wood) to 1.333 (lignum vitæ), and perhaps some kinds are even denser. But the sawdust of nearly all woods is heavier than water, and the actual specific gravity (*i. e.*, of the wood apart from enclosed air) is much the same in all. The quality and the apparent specific gravity of timber from the same species of tree often widely vary. Soil, climate, whether they grow in close proximity, and other conditions determine to a large extent the value of wood from trees of a like kind. For example, the timber of the Scotch fir (*Pinus sylvestris*) brought from the Baltic varies so much that the Swedish wood is only two-thirds the price of that which comes from Danzig, while the wood of the same tree grown in Scotland is of less value than either. With mahogany the qualities differ far more. Spanish or Cuba mahogany is of much greater value than, and sometimes twice as heavy as, Honduras or Bay mahogany from the same species of tree. Each of these varieties again is found to differ greatly in quality in different samples of the wood.

*Seasoning of Timber.*— Trees, and especially deciduous trees, should always be felled in winter, as in that season they contain the least amount of natural sap. They should not be allowed to remain long on the ground where they are cut down, but, as soon as possible, the logs ought to be stacked with packing pieces between them, to allow the sap freely to evaporate. They should also be covered in from the weather. When the logs are cut up into planks or boards these are usually in the first place laid horizontally, with lathes or fillets between them, and allowed to remain in this position for six months completely protected from rain. Afterward they are placed for the same length of time in a vertical position on racks, and kept a little apart. Most ordinary woods require this length of time to season them properly in a natural way, though some are ready for use sooner than others. The seasoning of timber can be hastened by steaming or boiling it, or, in the case of planks and thin cut wood, by placing it in hot air chambers. Natural seasoning is, however, by far the best. For cabinet work and the better kinds of joinery the naturally seasoned wood is, just before being used, usually put for a week or 10 days in a stove heated to about 120° F. The thorough seasoning of wood is of great importance, but too frequently is only partially effected.

*Preservation of Timber.*— For the external woodwork of buildings oil paint is usually employed, and the painting should be renewed every four or five years. Wooden ships and boats are coated with tar or pitch. But for such purposes as pavement, sleepers, piles, etc., treatment with certain chemicals which penetrate the wood more deeply has been proposed. Three methods of doing this have been chiefly tried, and of these the impregnation with bichloride of mercury is called kyanising; when sulphate of zinc is used the process is termed burnettising; and the third method — the only one extensively practised in Great Britain — is creasoting. The latter consists in steeping the wood in creasote oil, from 8 to 12 pounds being required for every cubic foot of timber. Since 1882 a new process introduced by H. Aitken, of Falkirk, has been under trial — namely, the soaking of timber, according to its bulk, from 2 to 12 hours in melted napthaline. This is a volatile substance, which must so far be against its efficiency, but the results of the experiments are said to give good promise of success.

According to the United States census of 1905 there were 19,127 establishments engaged in the manufacture of lumber and timber products, employing $517,224,128 capital and 404,626 persons; paying $183,-021,519 for wages and $183,786,210 for materials; and having an aggregate output valued at $580,022,690. In the fiscal year ending June 30, 1910, the exports of wood manufactures aggregated in value $78,813,-803; and the imports of wood and wood manufactures, $54,422,504. The principal lumber-producing region is now that of Michigan, Wisconsin, and Minnesota; but here, as in the older States, the forests are being rapidly and ruinously depleted, and ere long the United States will be compelled

to fall back for its chief lumber supply on the Pacific and Gulf States.

**Timbrel,** a kind of drum, tabor, or tabret, which has been in use from the highest antiquity, and is much the same as the tambourine.

**Timbuktu,** a city of the Sudan, Central Africa, in lat. 17° 37′ N. and lon. 3° 5′ W.; 6 miles N. of the Niger at the extreme N. point of its course. The town is triangular in shape, and at present is less than three miles in circumference, though formerly it was much larger. The wall or rampart which surrounded it was destroyed by invaders in 1826, and has not been rebuilt. The streets are for the most part straight and unpaved, with a gutter in the center. Most of the houses are of clay, and some are two stories high, a very unusual thing in Negroland. On the outskirts there are a good many conical huts of matting. Of the mosques, two are especially noteworthy from their great size and imposing appearance, viz., that of Sankoré in the N., and the great mosque in the W. angle of the town. The latter is 286 feet long and 212 feet wide. Timbuktu has also two markets. The climate is unhealthy, and the surrounding country being desert, or nearly so, all supplies of food are brought by the Niger from Sansanding to Kábara, the port of Timbuktu. The manufactures are confined to a little iron work, and to leather bags, pouches, cushions, etc., made by the Tuarick women. The place owes its importance entirely to its commercial situation, which makes it the entrepôt for the trade between the N. and S. of the Sahara. In addition to the Niger there are two main channels by which commerce flows to Timbuktu, viz., the caravan routes from Morocco on the N., and Ghadames on the N. E. The principal articles of trade are gold in rings, salt, English calico, red cloth, cutlery, looking-glasses, rice, negro corn, kola nuts (a substitute for coffee), ginger, tobacco, dates, and tea. Timbuktu was founded toward the end of the 11th century, and became known to Europeans in 1373. Pop. about 12,000.

**Timby, Theodore Ruggles,** an American inventor; born in Dover, N. Y., April 5, 1822; invented the revolving turret for the orignal "monitor," the mole-tower system of defense, the revolving-tower and shield system, the "American" turbine water wheel, and the method of firing heavy guns by electricity. He died Nov. 9, 1909.

**Time.** Time and space are the two great elements with which the astronomer in the observatory has to deal; consequently a great part of astronomical work, and a great part of the equipment of every observatory, is devoted to the determination of time in various ways and for various purposes. With the increase of civilization and the vast growth of industrial and commercial enterprises, combined with the sharp competition in all their branches, the commercial demand for accurate time distribution has also made new demands on the astronomer, and though this part of the work in no way increases or advances astronomical knowledge directly, yet it is one of the many ways in which astronomy becomes of immediate practical benefit to the people at large, and its commercial value has become the principal source of income to many small observatories.

*Measurement of Time.*— This is accomplished by the joint work of the clock and watchmakers, and of the astronomer who makes observations of the transits of the heavenly bodies across the meridian to determine the necessary daily corrections to these instruments. For no piece of chronometric apparatus, even the best constructed astronomical clock, can begin to approach in regularity of running the motions of the heavenly bodies, especially the rotation time of the earth on its axis, on which most time determinations depend. The principal pieces of apparatus used for keeping time are various forms of clocks and watches. Before the invention of these instruments the measurement of time was very rough, the most accurate being the method of the sun dial; but as this was only good in the day time and when the sun was shining, various rougher devices were employed, such as running sand in the hour glass, the water clocks, or clepsydræ, or even a burning candle. The senseless division of the day into two periods, (of 12 hours each,) which was probably originally brought about by the use of the sun's shadow in the day time and something or nothing else in the night, is one of the relics of barbarism which seems to be the hardest to get rid of. Even the division into 24 hours (instead of decimals of the whole day, as it ought to be) is bad enough, but, on account of the radical change necessary in the construction of all clocks and watches in order to bring this about, it will probably be a long time in coming. But the small changes necessary in the dials in order that they may read up to 24 hours instead of 12 makes it surprising that there is so much opposition to the proposal of the railroad managers simply to print their time tables with the day divided in that way. Astronomers have always divided the day into 24 hours, and even then in some of their work are obliged to reduce these hours, minutes, and seconds to decimals of a day to save a great mass of labor in computation. Some day all clock faces and all divided circles of instruments of every kind will be decimally divided (the day into 10 hours, the hour into 100 minutes, and the minutes into 100 seconds), and then our descendants will won-

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der how we ever put up with the present awkward arrangement.

*Different Kinds of Time.*— Two different kinds of time, with different actual lengths of the unit, are in common use — mean solar and sidereal. The mean solar day marks the average interval of the return of the sun to the same meridian. The time marked by the return of the actual sun is not uniform, and is called apparent time. The difference between mean and apparent time is called the equation of time. Mean solar time is that in common use, but the mean solar day is used in two different ways; the one called the civil day, or civil time, begins the day at midnight, and is the one used by the people at large. The other, used by astronomers, begins the day at mean noon, reckoning it from 0 to 23 + hours. The day begins 12 hours later than the civil day, or 12 hours earlier, according to how the matter is viewed. Thus at 6 P. M., Jan. 23, the astronomer calls it Jan. 23 days 6 hours, or Jan. 23.25 days, if he expresses it decimally. Likewise he calls Jan. 24 at 6 A. M. Jan. 23 days 18 hours, or Jan. 23.75 days. If we consider that 23.25 days and 23.75 days are still parts of the 23d day, then the astronomical day is half a day behind; but if they are to be regarded as parts of the 24th day, as they should be just as much as 1850 is regarded as the middle of the 19th and not the 18th century, then the astronomical day is 12 hours ahead of the civil. It is simply a question of interpretation. The astronomical time, as above defined is generally called simply "mean time," to distinguish it from either civil time or sidereal time. The full distinctive names of the three would be civil mean solar time, astronomical mean solar time, and sidereal time. The last two are generally denoted by astronomers as mean time and sidereal time, and are sufficiently distinctive.

Sidereal time is of an entirely distinct length from mean solar, the sidereal day marking the successive transits of the vernal equinox over the meridian, and being very nearly equal to the rotation time of the earth on its axis. The sidereal day equals 23 hours 56 minutes 4.090 seconds of mean solar time, and there is one more sidereal day in the year than solar days. The sidereal day is not of absolute uniform length, as the precession of the equinoxes is not absolutely uniform, but the variations in its length are out in decimal places of seconds beyond those given above. Sidereal time is only used in observatories by astronomers. All observations with transit instruments for the determination of the right ascensions of the heavenly bodies are recorded by sidereal clocks, and the observations made simply for the purpose of getting the corrections to a mean time clock for the purposes of time distribution are generally made on the stars, using a sidereal clock or chronometer, and then the mean time clock is compared with the sidereal afterward to determine its correction.

*Time Signals.*— Many observatories send out time signals either daily, hourly, or sometimes continuously every second, or every other second, to various parts of the country for the purpose of giving accurate time to all sorts of industries. They are sent over the telegraph lines, the wires being permanently run into the observatories for the purpose, and the signals are generally sent automatically by a distributing clock which is kept as near the exact time as possible. An electric current passes through the clock and is broken or closed regularly by a toothed wheel on the second hand arbor of the clock. Perhaps the best known set of time signals is that sent out by the Naval Observatory at Washirgton. It is as follows: three or four minutes before noon, whenever the telegraph companies switch in the loops to the observatory, the clock begins to send out make-circuit signals every second over the various lines, the minutes being indicated by leaving out the seconds 55, 56, 57, 58, and 59 in each, and the half minutes by leaving out the 29th second of each. The click following such a one-second gap then always indicates the beginning of a half-minute, and the first following a gap of five seconds indicates the beginning of a minute, except at the exact noon. Just before this there is a gap of 10 seconds, and then exactly at noon the circuit closes and remains closed for just a whole second, the beginning of the mark indicating exact noon. The closing for a whole second is in order to make sure that that particular mark goes through all the telegraph lines, for this particular signal is made to do a great many things at different places, such as the dropping of time balls, and it is more important that this particular second be distinctly sent than any of the others. After the break at the close of the noon signal the telegraph companies quickly switch out the loops to the observatory, and the lines immediately resume their normal work. In the city of Washington this particular noon signal drops a time ball on the top of the State, War, and Navy Department building, and it also automatically corrects, by setting forward or back exactly to 0 hours 0 minutes 0 seconds, all the clocks in the department buildings of the government, no matter how much they may have gained or lost since the preceding noon.

*Local, Universal, and Standard Time.*— Local mean time is that indicated by the transits of the sun at any particular meridian, and of course this differs for places of different longitudes on the surface of the earth. In fact, the difference of longitude between two places is simply the difference

of their local times and the accurate determination of this difference is one of the most common kinds of astronomical work, especially in the principal observatory of any country. The operation consists simply in making the most accurate determination possible of the clock-corrections at each observatory, and then comparing the clocks by telegraphic time signals with each other. But if this local time is used as the standard time at every place it causes the greatest confusion to people traveling from one place to another and to the railroads connecting them. England early adopted the time of the Greenwich meridian for the whole country, and likewise France that of Paris. In the United States uniformity was more difficult on account of the great difference of longitude of its different parts, San Fransisco time being nearly four hours slower than the local time in the E. part of Maine. But an excellent compromise was brought about in 1883, principally through the influence of the railroads, pushed on by a few scientific men, and it resulted in the present system of standard time throughout the country. This is based on Greenwich time, and differs from it at any place by some whole number of hours, the minutes and seconds being the same over the whole country, and exactly the same as those of Greenwich. The E. part of the country uses time five hours slower than that of Greenwich, or Greenwich five-hour time; *i. e.*, when it is standard noon in the E. part of the United States it is 5 P. M. at Greenwich. In the Mississippi valley they use Greenwich six-hour time. The dividing line is not an arbitrary one, but is settled by the railroads, generally where they find it most convenient to change at the end of divisions of the roads. The Pennsylvania roads change at Pittsburg. The cities and towns along the roads adopt the time of the nearest railroad, and no inconvenience results even where the difference of standard from local time is something more than half an hour. The only inconvenience is in cities like Pittsburg, where two different hours are used by different railroad systems centering there. But the trouble is infinitely less than it was when there were more than 70 different standards of railroad time in the country. Out on the plains they use Greenwich seven-hour time, and on the Pacific slope Greenwich eight-hour time. These four standards are commonly called the Eastern, Central, Mountain, and Pacific time, respectively.

While the above is not an ideal system, it is about the best that can be used at the present time. If the people at large can ever be educated up to the standard of dissociating entirely 12 o'clock from noon, then we can adopt a universal time for all parts of the earth. This is already done by many scientific men, especially astronomers, meteorologists, and those having any thing to do with terrestrial magnetism, it being necessary in all these matters to have a common universal time for use, and Greenwich time, either mean or civil, as defined above, is almost universally adopted for these purposes. Such a time is also a necessity in international telegraphic communication, and, once adopted, would be found of universal convenience. Its introduction would come about much easier if at the same time the 12 or 24 hour division of the day could be abandoned, and the decimal division of a universal day come into general use. This, however, involves the abandonment of all existing time pieces and the purchase of new ones showing the decimal division of the day, and as this involves a large financial outlay it will be very difficult of introduction.

**Timoleon,** a Greek general; born of a noble family at Corinth in the beginning of the 4th century B. C. He saved the life of his brother Timophanes in a battle with the Argeians; but his patriotism was stronger than his personal affections, and when that brother sought to establish a "tyranny," Timoleon procured his assassination, 366 B. C. Though this act was generally approved, yet his own remorseful misgivings and his mother's reproaches preyed on his mind, and for 20 years he lived in close retirement. In 344, when Timoleon was 50 years old, ambassadors from Syracuse arrived at Corinth inploring aid against Dionysius the younger, who was seeking to recover his authority over their city. Timoleon was made leader of the Corinthian expeditionary force, and by stratagem, diplomacy, bravery, good generalship, and, perhaps most of all, good fortune, ultimately made himself master of Syracuse, repelling the efforts of the Carthaginian allies in a great battle at Crimissus (339 B. C.). In six years he succeeded in clearing Sicily of tyrants, and in establishing free democratic constitutions. His work now done, he resigned his power and lived a private citizen profoundly respected, till his death in 337–336. His brilliant successes, his constant good fortune, and the tragic story of his disinterested sacrifices, make Timoleon a unique figure in ancient history. Plutarch and Cornelius Nepos have written his life.

**Timon,** an Athenian misanthrope; born near Athens, and lived in the last part of the 5th century B. C. The faithlessness of his friends and successive dissappointments soured his nature, and drove him into solitude; where he is said, however, to have welcomed Alcibiades. His name has become proverbial, and his story is familiar through the tragedy of Shakespeare.

**Timor** (tē-mōr′), the most important of the chain of islands which stretch E. from

Java; length 300 miles; area 17,698 square miles; pop. approximately, 119,239. A chain of wood-clad mountains runs throughout its entire length; one peak, Allas, near the S. coast, being 11,500 feet in height. It is less volcanic than its smaller neighbors of the Sunda group, but it contains some quiescent or extinct volcanoes. Magnetic iron, porphyry, gold, copper, and sulphur are found. Otherwise the natural wealth of the island is not great, the comparatively dry climate producing a much less luxuriant vegetation than in Java. The exports are mainly maize, sandalwood, wax, tortoise-shell, and trepang. Separated from the Australian region by the Arafura sea, the island shows few Australian types among its fauna and flora, which resemble those of Java, Celebes, and the Moluccas. The population is mainly Papuan, mixed with Malay and other elements. The smaller W. portion belongs to the Dutch, with its capital at Kupang; the E. part is Portuguese, capital Deli; but native chiefs really govern the island.

**Timorlaut** (tē-mōr'lout) ("Timor lying to seaward"), a small group of islands in lat. 6° 40′–8° 23′ S., lon. 130° 26′–132° E, 260 miles E. of Timor. It consists of eight considerable islands of volcanic formation, and a great number of coral islets. The chief islands are Timorlaut, Larat, and Tenimber; the first, which is by far the largest, measuring 80 miles by 25. All three are very mountainous. The group lying within the range of the damp S. E. winds which blow through Torres Strait has a much more humid climate than Timor, and luxuriant forests ascend to the very summits of the mountains. The natural wealth of the islands is as yet undeveloped, and tortoise-shell and beche-de-mer are the chief articles of trade. The natives resemble those of Northwestern New Guinea in appearance, and are fierce and treacherous.

**Timotheus,** a famous Greek musician, who lived about the end of the 5th century B. C.

**Timothy** ("one who honors God"), one of the companions of St. Paul on his missionary travels. Timothy was born either at Lystra or Derbe; his father was a Greek, his mother a Jewess (Acts xvi: 1–2). Both his mother, Eunice, and his grandmother, Lois, were Christians (II Tim. i: 5), having probably been converted by St. Paul on his first missionary tour through Lycaonia (Acts xiv: 6). Hence Timothy early knew the [Jewish] scriptures, probably with Christian interpretations (II Tim. iii: 15); but his actual conversion seems to have been effected through the instrumentality of St. Paul, if, indeed, this be the meaning of the phrase "my own son in the faith" (I Tim. i: 2). His constitution was feeble, sensitive, with a certain tendency to asceticism, yet not free from temptation to "youthful lusts" (II Tim. ii: 22). He was strongly recommended to St. Paul by the Christians at Lystra and Iconium. The apostle therefore chose him as missionary colleague, and had him circumcised for the sake of facilitating his work among the Jews (Acts xvi: 3). He thoroughly gained the confidence and affection of St. Paul, and was with him in Macedonia and Corinth (A. D. 52–53; Acts xvii: 14, xviii: 5; I Thess. i: 1), and at Ephesus, from which he was dispatched for special duty to Corinth (A. D. 55–56; I Cor. iv: 17, xvi: 10). Returning, he was with St. Paul when the second epistle to the Corinthians and that to the Romans were penned (II Cor. i: 1; Rom. xvi: 21), as also when he passed through Asia Minor prior to his arrest (A. D. 57–58; Acts xx: 4), and during his imprisonment at Rome (A. D. 61–63; Col. i: 1; Philem. 1; Phil. i: 1). Probably about A. D. 64 he was left in charge of the Ephesian church. In Heb. xiii: 23 his own imprisonment and liberation are recorded. Tradition makes him ultimately suffer martyrdom, either in A. D. 96 or in A. D. 109.

*The First Epistle of Paul the Apostle to Timothy.*—An epistle addressed by St. Paul to Timothy. Some persons in the Ephesian church had taught, or appeared disposed to teach, a doctrine different from that of the apostle. Paul therefore, on departing from Macedonia, left Timothy behind to restrain these false teachers (I Tim. i: 3–7), pretentious men too much given to profitless "fables and endless genealogies" (verse 4). Paul charged Timothy to preach the Gospel, defining it as a "faithful saying, and worthy of all acceptation, that Christ Jesus came into the world to save sinners" (i: 5–20). Paul then commends prayer (ii: 1–8), defines the position of women in the Christian church (9–15), explains the duties of a bishop (iii: 1–7), and of a deacon and his wife (iii: 8–13), and, expressing the hope that he soon may see Timothy (iii: 14), he gives him personal counsel (15), presents as beyond controversy the mystery (hidden thing) of godliness (16), predicts by the Spirit perilous times (iv: 1–4), adds fresh injunctions to his younger colleague (v–vi), explaining what his action should be toward elderly and younger men, and elder and younger women (v: 1–16), the Christian functionaries called elders (17), slaves (vi: 1–2), the rich (17–19), and what should be his conduct in the office which he held in trust (20–21). Eusebius summed up the verdict of Christian antiquity in placing the first epistle to Timothy among the Homologoumena. Modern rationalistic critics, from Schmidt and Schleiermacher to Renan, have denied its authenticity, of which, however, there have been powerful defenders. Various dates have been assigned it; one of the most probable is A. D. 56.

*The Second Epistle of Paul the Apostle to Timothy.*— An epistle written by St. Paul after he had become a prisoner (i: 8) in Rome (17), in bonds (ii: 9), who had been at least once judicially examined and been required to make his "answer" (iv: 16), a crisis which, however, ended in his being "delivered out of the mouth of the lion" [Nero(?)] (iv: 17). Commencing by expressing his love for Timothy, and his earnest desire to see him (i: 1–5), he exhorts him to steadfastness in the faith (6–18), to hardiness and unworldliness (ii: 1–7), to the avoidance of frivolous and entangling questions, to purity (ii: 8–23), and to meekness under provocation (24–26). His counsels are all the more fervent that many have deserted him for heresy or the world (i: 15, ii: 17, 18, iv: 10); and he foresaw that a general impatience of sound doctrine was destined to appear (iii: 1–17, iv: 1–4). A certain air of sadness pervades the epistle, but the writer looks forward to his probably near martyrdom in tranquil trust in his Redeemer whom he had served so long and so well (iv: 6–8). He closes with sundry greetings and with the benediction. The evidence for the authenticity of the epistle is the same as that for the previous letter. Two dates assigned it are A. D. 63, and July or August A. D. 65. It seems to have been the last of St. Paul's epistles.

**Timothy Grass** (*Phleum pratense*), a hard coarse grass with cylindrical spikes from 2 to 6 inches long. It is used mixed with other grasses for permanent pasture, and grows best in tenacious soils. It is extensively cultivated throughout Great Britain, and also in North America. Timothy Hanson first recommended it, hence its name. Swine refuse it.

TIMOTHY GRASS.

**Timothy Titterwell.** See KETTELL.

**Timothy Trimm.** See LESPES, LEO.

**Timrod, Henry,** an American poet; born in Charleston, S. C., Dec. 8, 1827. His only volume of "Poems" was published in 1860; reprinted and edited with memoir by Paul H. Hayne, 1873. He died in Columbia, S. C., Oct. 6, 1867.

**Timur** (tē-mör'), called also TIMUR BEG and TIMUR LENK (that is, Timur the Lame), and, by corruption, TAMERLANE, a celebrated Oriental conqueror, of Mongol or Tartar race; born in the territory of Kesh, near Samarcand, in 1336. His ancestors were chiefs of the district, and Timur by his energy and abilities raised himself to be ruler of all Turkestan (1370). By degrees he conquered Persia, and the whole of Central Asia, and extended his power from the great wall of China to Moscow. He invaded India (1398), which he conquered from the Indus to the mouths of the Ganges, massacring, it is said, on one occasion 100,000 prisoners. On his way from India to meet the forces of Bajazet, the Turkish sultan, he subjugated Bagdad, plundered Aleppo, burned down the greater part of Damascus, and wrested Syria from the Mamelukes, after which he overran Asia Minor with an immense army. Bajazet's army was completely defeated on the plain of Ancyra (Angora), in 1402, and the Sultan was taken prisoner. The conquests of the Tartar now extended from the Irtish and Volga to the Persian Gulf, and from the Ganges to the Grecian Archipelago. He was making mighty preparations for an invasion of China when death arrested his progress at his camp at Otrar, beyond the Sir-Daria, in 1405, and his empire immediately fell to pieces. He was fanatical in his religion, and though no conquests were ever attended with greater cruelty, devastation, and bloodshed, he was in a measure a patron of science and art, and is also reputed author of the "Institutions of Timur" and the "Autobiography of Timur," both translated into English. He is the hero of Marlowe's "Tamburlaine."

**Tin,** in chemistry, a white, metallic, easily fusible metal, not much affected by exposure to dry or moist air at ordinary temperatures, but becoming oxidized superficially when heated, burning with a brilliant flame if the temperature be raised sufficiently high. It dissolves in hydrochloric acid, with the evolution of hydrogen, forming hydrated chloride of tin. Strong nitric acid acts on it violently, producing an insoluble hydrated binoxide of the metal, a considerable amount of ammonia being formed at the same time by the decomposition of the water and nitric acid present. Cold dilute sulphuric acid has no action on it, but if the concentrated acid be used, the metal is converted into the sulphate, while sulphurous acid escapes. Hot dilute sulphuric acid also converts it into sulphate of tin, hydrogen being evolved. The tin which is imported from Banca is nearly pure; that made in England generally contains small quantities of arsenic, copper, iron, and lead. In its chemical characteristics, tin has but few alliances. In some of its properties, however, it seems related to tantalum and titanium. Its chemical combinations are numerous and important,

Tin

and its resistance to oxidation and to the action of vegetable acid renders it extremely useful for domestic purposes. Symbol St. Prof. Forrest Shepherd, of Missouri, advanced an assertion that tin is not a simple, but a compound metal. His opinion, nevertheless, so far as we know, is not the result of analyses, but of speculation and inconclusive analogies.

In metallurgy, tin is a white metal, with a slight yellowish tinge, and a brilliant metallic luster. It is wanting in tenacity, but is extremely malleable at a temperature of 212°. It has a great tendency to crystallize, and its crystalline form may be easily shown by rubbing a piece with a little nitric or hydrochloric acid, when it assumes the appearance known as *moire métallique*. By slow cooling it may be procured in octohedral crystals, and on bending a piece of tin backward and forward, a peculiar crackling or grating sound is heard, from the friction of the internal crystals. It fuses at 442° F., but it is not sensibly volatilized at that or any higher temperature. If it is stirred while melted till it cools, it may be obtained in a state of powder. Its brilliancy and power of resisting atmospheric changes, render it exceedingly useful in the arts as a covering for other metals. What is ordinarily called tin in domestic language, is sheet-iron covered with a layer of tin, a process which is explained further on. Copper is also very well fitted for being coated with this metal. In India, it is applied instead of steel and iron to articles by way of ornament, and there is no reason why our artisans should not take pattern from their more artistic Eastern brethren.

For the manufacture of tin plates, the best soft charcoal iron is obliged to be used. After it has been rolled and cut to the requisite size, its surface is made chemically clean by immersion for a few minutes in dilute sulphuric acid. The sheets are then heated to a red heat in a reverberatory furnace, withdrawn, allowed to cool, hammered flat, and passed between polished rollers, and then washed in dilute acid. This preparation is needed to free the surface of the iron from the slightest portion of oxide, to which the tin would not adhere. In order to tin them, they are plunged one by one into a vessel of tallow, from which they are transferred to a bath of tin. From this they are taken after a certain time, allowed to drain, and dipped again. The superfluous tin at the edge of the plate is removed by dipping it in the melted tin once more, and detaching it by giving the plate a sharp blow. The tin and iron form a perfect alloy with each other. The appearance known as *moire métallique* is given by sponging the surface of the tin with dilute nitro-hydrochloric acid, washed with water, and afterward varnished with plain or colored varnish. Copper is tinned in the same way, but with greater ease, it being so much less difficult to clean the surface of that metal than iron. Tinfoil is made by beating pure tin to the requisite thinness. The alloys of tin are numerous and important. The principal of these are Britannia metal, consisting of equal parts of brass, tin, antimony, and bismuth; pewter, 4 tin, and 1 lead; Queen's metal, 9 tin, and 1 each of antimony, bismuth, and lead; the various solders; bell-metal, 78 copper, 22 tin; bronze, copper, with 4 to 6 per cent. of tin; gun metal, 78 copper and 22 tin; and several others. Speculum metal, used for the mirrors of reflecting telescopes, is a steel-white, hard, brittle alloy, of 1 part of tin and 2 of copper. An amalgam of tin and mercury is used for silvering looking glasses. A sheet of tinfoil is laid on an edged slab of stone carefully levelled, and mercury is poured on it till it forms a layer ⅛ inch thick. Glass is laid down on this, and the table is tilted to let the superfluous mercury run off, weights being gradually placed on the glass to facilitate the operation. Tin ores are met with but in few localities.

Cornwall, Banca, Mexico, and some parts of Australia, are the only important tin yielding districts. The most celebrated tin mines are those of Cornwall, England, which have been worked uninterruptedly from the earliest historic periods. In the United States, crystals of the oxide of tin have been found in localities of Massachusetts, New Hampshire, New York, New Jersey, Virginia, California, Missouri, and perhaps in other States, but though some of the mines, as those of Missouri and California, seem promising, tin has not been worked profitably up to the present time. The only ore of importance is tin stone, a hard dark-brown crystalline body consisting of the binoxide in a crystalline condition. To extract the metal, the ore is first stamped and washed, to get rid of the lighter particles of sand or earth adhering to it. It is then roasted, to free it from arsenic and sulphur, and again washed to carry off the sulphate of copper and oxide of iron. The washed ore is mixed with from one-fifth to one-eighth its weight of powdered anthracite or charcoal, and with a small portion of lime to form a fusible slag with any of the remaining gangue. The charge is placed on the hearth of a low-crowned reverberatory furnace, and the doors are closed up. Heat is applied very gradually for five or six hours, care being taken to raise the temperature high enough to cause the carbon to reduce the tin without melting the silicious gangue, which would form with the binoxide an enamel troublesome to remove. When nearly all the tin is reduced, the heat is raised considerably, the slags being thus rendered

fluid and capable of floating on the top of the melted metal. The tin is then run off into cast iron pans, from which it is ladled off into molds to form ingots. The tin thus procured is far from being pure; it is therefore submitted to the process of lignation, which consists in heating the ingots to incipient fusion. By this means the purer tin which fuses at a comparatively low heat, separates, running down, and leaving the impure portions behind. The less fusible portion, when remelted, forms block tin and the part which has run out is again melted and agitated with wet stakes. The steam thus formed bubbles up to the surface, carrying with it all other mechanical impurities contained in the tin. The mass is then skimmed and allowed to cool. When just about to set, the upper half is ladled out, the other metals and impurities having sunk into the bottom half, from the tendency that this metal has to separate from its alloys. The finest quality of tin is frequently heated to a temperature just short of its melting point. At this heat it becomes brittle, and is broken up into masses, showing the crystals of the metal, and forming what is known as grain tin. The formation of crystals is to some extent a guarantee of its purity, since impure tin does not become brittle in this way. English tin generally contains small quantities of arsenic, copper, iron and lead.

*Chlorides of Tin.*—There are two chlorides of tin, the protochloride and the per- or bichloride. The protochloride, SnCl, may be prepared in the anhydrous state by the action of dry hydrochloric acid on tin at a gentle heat. The hydrated chloride is obtained by dissolving the metal in hydrochloric acid diluted with an equal bulk of water. It crystallizes in transparent needles, containing two equivalents of water. It is a powerful reducing agent, and is much used by dyers for altering reducible coloring matters, such as sesquoixide of iron and peroxide of manganese. It is also used as an antichlore. It forms crystallizable double salts with the alkaline chlorides. The bichloride, perchloride, or fuming liquor of Libavius, $SnCl_2$, is made by passing chlorine over an inclined tube, fitted to a receiver, and containing pieces of tin-foil rolled up. When pure, it is a colorless liquid, evolving suffocating white fumes in the air. Dropped into water, it forms a hydrate, crystallizing with five equivalents of water. It forms salts with the alkaline chlorides. It is used to a considerable extent in solution in dyeing. It absorbs sulphuretted and phosphuretted hydrogen, and forms a compound of ammonia. In some respects it plays the part of an acid — chlorostannic acid.

*Oxides of Tin.*—There are two oxides of tin — the protoxide and the binoxide. The protoxide is prepared in a variety of ways, too prolix for description here, and is only interesting in a chemical point of view. When heated in air, it burns like tinder, and is converted into the binoxide. The only ore of tin, tin-stone, is a form of the binoxide.

*Sulphides of Tin.*—There are two sulphides of tin — the protosulphide, formed by fusing together metallic tin and sulphur. The bisulphide, when prepared in the dry way, is known by the name of "aurum musivum," or mosaic gold, and is used as bronze powder in coarse decorative works. It is prepared by fusing together seven parts of flowers of sulphur and six of sal-ammoniac, with an amalgam of 12 parts of tin and 6 of mercury. The ingredients are kept in a melted condition until no more white fumes issue from the flask, and the bisulphide is found as a yellow crystalline layer at the top. A second sublimation is necessary to give it its greatest degree of brilliancy.

**Tinamidæ,** in ornithology, a family of game birds with 9 genera and 39 species. Bill straight, flattened, with membrane at base, nostrils large; wings short and concave, toes long. They form a very remarkable family, with the general appearance of partridges or hemispheres, but with the tail very small or entirely wanting. They differ greatly in their organization from any of the Old World *gallinæ*, and approach, in some respects, the ostriches. They are very terrestrial in their habits, frequenting the forests, open plains, and mountains of the Neotropical region, from Patagonia and Chile to Mexico, but are absent from the Antilles. Their coloring is very sober and protective, as is the case with so many ground birds, and they are seldom adorned with crests or other ornamental plumes, so prevalent in the order to which they belong.

**Tinamou,** the name given to a genus and family of birds occurring in South America, and allied in some respects to the ostrich

THE TINAMOU.

and emu. They somewhat resemble a partridge, and vary in size from that of a pheasant down to that of a quail. The great tinamou (*Tinamus brasiliensis*) is about

18 inches long, and inhabits the forests of Guiana.

**Tinamus,** in ornithology, the type genus *Tinamidæ,* with seven species, ranging from Mexico to Paraguay. Bill rather short, hooked at tip, sides compressed, nostrils toward base; wings with third and fourth quills longest, tips curved; tail very short, coverts lengthened; claws thick and short.

**Tinca,** in ichthyology, the tench; a genus of *Cyprindæ,* with a single species, *T. tinca,* found all over Europe in stagnant waters with soft bottom. Scales small, deeply imbedded in the thick skin; lateral line complete; dorsal short, having its origin opposite the ventral, anal short, caudal somewhat truncated; mouth anterior, with a barbel at the angles; bill-rakers short, lanceolate; pseudo-branchiæ rudimentary; pharyngeal teeth cuneiform, slightly hooked at the end.

**Tincal,** the commercial name of borax in its crude state. See Boracic Acid.

**Tincalconite,** a pulverulent and efflorescent variety of borax, containing 32 per cent. of water, found in California.

**Tincker, Mary Agnes,** an American novelist; born in Ellsworth, Me., July 18, 1833. During part of the Civil War she was a volunteer nurse in Washington; in 1873–1887 she resided in Italy, visiting Spain, France, and England. She wrote: "The House of Yorke" (1872); "A Winged Word" (1873); "Grapes and Thorns" (1874); "Six Sunny Months" (1878); "Signor Monaldini's Niece" (1878); "By the Tiber" (1881); "The Jewel in the Lotus" (1884); "Aurora" (1885); "Two Coronets" (1887); "San Salvador" (1889); "Autumn" (1898); etc. She died in 1907.

**Tincture,** in chemistry, the finer and more volatile parts of a substance, separated by a menstruum; an extract of a part of the substance of a body communicated to the menstruum. In heraldry, the name given to the colors, metals, or tints used for the field or ground of an emblazoned shield, including the two metals or an argent, or gold and silver, the several colors, and the furs. In pharmacy, a colored solution of some animal or vegetable principle. Tinctures are very numerous. Garrod has a list of nearly 70, commencing with the tincture of aconite and the tincture of aloes. Different menstrua are employed; chiefly rectified spirit, proof spirit, compound spirit of ammonia, and spirit of ether.

**Tindal, Matthew,** an English deist; born in Devonshire, England, in 1657; studied at Lincoln and Exeter Colleges, Oxford; graduated B. A. in 1676; and was elected Fellow of All Souls in 1678. In opinions he was first High Church, then Roman Catholic (1685); next Low Church, and finally Rationalist. His chief work, "Christianity as Old as the Creation, or the Gospel a republication of the Religion of Nature," was published anonymously in 1730, when the author was an old man. The argument of the book is that Christianity, as far as it is true, must be the religion of nature; for as God is unchangeable, so is human nature. Thus everything of value in any religious system is already given us outside of that system. Tindal attacks many of the statements in Scripture, especially those bearing on Jewish history in the ordinary rationalistic manner; but he does not explicitly deny the truth of the Christian revelation, though all his arguments tend to show that it is superfluous. Answers and refutations were numerous. Of Tindal's other works the following are the most important: "Four Discourses of Obedience to the Supreme Powers" (1694); "Rights of the Christian Church Asserted" (1706); "New High Church turned Old Presbyterian" (1709); "A High Church Catechism" (1710). He died in Oxford, Aug. 17, 1733.

**Tindale, William.** See Tyndale.

**Tinder,** any substance artificially rendered readily ignitable but not inflammable. Before the invention of chemical matches it was the chief means of procuring fire. The tinder, ignited by a spark from a flint, was brought into contact with matches dipped in sulphur. Tinder may be made of half-burnt linen, and of various other substances, such as amadou, touchwood, or German tinder.

**Tin Dichloride,** $SnCl_2$; stannous chloride; a gray resinous-looking substance, obtained in the anhydrous state by distilling a mixture of calomel and powdered tin. It is fusible below redness, and volatile at a higher temperature.

**Tin Dioxide,** $SnO_2$; stannic oxide; a white amorphous powder prepared by heating tin, or tin monoxide, in contact with air. It is very soluble, not being attacked by acids even in the concentrated state.

**Tinea,** in entomology, the typical genus of *Tineidæ.* Head hairy; antennæ in the male sometimes slightly ciliated; maxillary palpi folded, generally five-jointed; labial palpi cylindric, hairy, or bristly; fore wings oblong, ovate; hind wings ovate, clothed with scales. Some are very destructive to clothes, specially *T. biselliella* and *T. pellionella.* The expansion of their wings is about half an inch. The first has the fore wings glossy, pale ocherous, with no spots, the hind wings whitish, with pale ocherous cilia. It feeds largely on horsehair, and constructs silken galleries in the interior of chairs, sofas, mattresses, etc., and attacks car-

pets. The second species has three indistinct, brownish spots on the fore wing, the larva has a reddish-brown head; it attacks quills, feathers, stockings, cloth, etc., constructing a portable case of the substance on which it feeds. Both are common in houses throughout the year, but are most abundant in summer. Another destructive species is *T. tapezella*, which has a wing expanse of three-quarters of an inch; the base of the fore wings is black, the apex white; the larva feeds on the linings of carriages, green baize, down, etc., constructing a gallery partly of the cloth, partly of its own silk. It is found in June and July on palings, in houses, etc. *T. granella* attacks corn in granaries, and *T. ochraceella* lives in ants' nests.

Tinea, in pathology, is a group of skin diseases produced by vegetable fungi in or on the epidermis, the chief being ring-worm. There are many species: *T. tonsurans, T. kerion, T. favosa, T. decalvans, T. sycosis,* and *T. versicolor.*

**Tinfoil,** pure tin, or an alloy of tin and lead, beaten into leaves about $\frac{1}{1000}$ part of an inch thick. When coated with mercury it forms the reflecting surface of glass mirrors.

**Tingi,** a Brazilian name for the leaves of *Magonia glabrata* and *M. pubescens,* two medium-sized gregarious trees of the natural order *Sapindaceæ.* The seeds of the fruit yield a sort of soap. An infusion of the root is used for stupefying fish, and the bark is applied to ulcers and sting sores.

**Tinginæ,** in entomology, a sub-family of *Membranacea.* The most typical forms are exceedingly depressed, the hemelytra frequently closely reticulated and semi-transparent. They are minute and very delicate bugs found upon various trees and plants, chiefly herbaceous, feeding on their juices. Sometimes elevated to the rank of a family *Tingidæ.*

**Tinkar's Root,** in botany, the root of *Triosteum perfoliatum,* growing in the United States. It is two or three feet high, with large, oval, acuminate leaves, dull purple flowers, and orange colored berries. In small doses it is a mild cathartic; given in larger quantity, it produces vomiting. Its dried and roasted berries have been used as a substitute for coffee. It derives its popular name from a Dr. Tinkar, who first used it medicinally.

**Tin Monoxide,** SnO; stannous oxide; a dense black powder prepared by heating stannous oxalate out of contact with air. It is permanent in the air, but when touched with a red-hot wire takes fire and burns like tinder.

**Tinnevelli** (Tiru-nel-veli), chief town of the British district of the same name, in India; situated 1½ miles from the Tamraparni river. The town of Tinnevelli is conected with the town and military station of Pallamcotta, on the opposite bank of the river, which is the administrative headquarters of the district. It contains a Sind temple and a Hindu college, and has a cotton factory. It is an important Protestant missionary center, and the terminus of the Tinnevelli branch of the South Indian railway. Pop. (1891) 24,768.

**Tinning,** the art, act, or process of coating other metals with tin for the purpose of protecting them from oxidation or rust. Hollow ware is tinned inside, having been first thoroughly cleaned and heated, by pouring grain tin into the vessel and turning and rolling it about so as to bring it in contact with every part. Powdered rosin is used in the bath to prevent the formation of an oxide, and the surface of the ware is rubbed with cloth or tow to aid the process. In cold tinning an amalgam of tin and mercury is applied to the metal, the mercury being afterward driven off. Bridle bits, stirrups, and other small articles are tinned by immersion. Also, the coating or layer of tin so laid on (see TIN PLATE). Also, canning; packing meat, vegetables, etc., in tins.

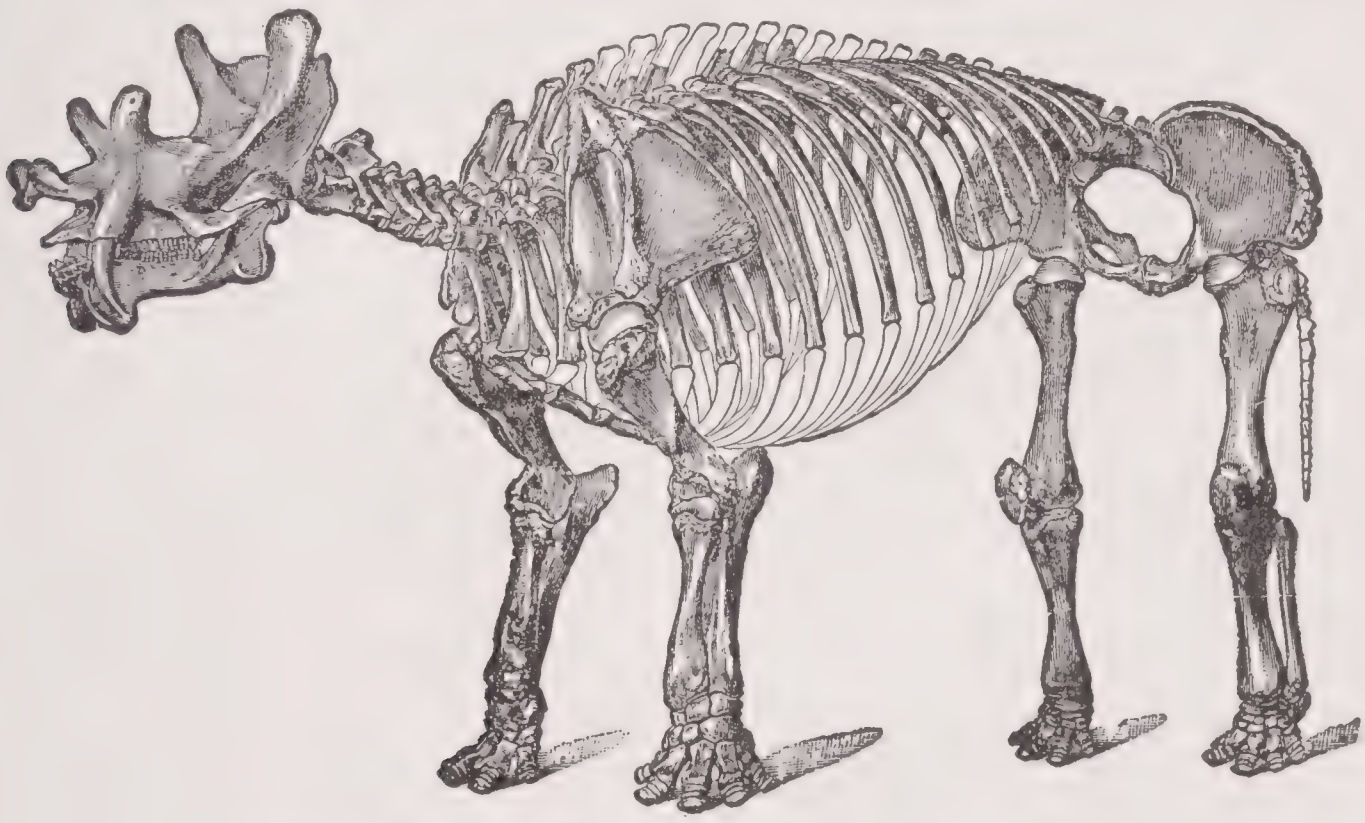
**Tinnitus** (tin'-) **Aurium** (Latin), the medical term for ringing in the ears. In most cases it is an unimportant symptom, depending on some local temporary affection of the ear, or on some disturbance of the digestive system with which the part of the brain, from which the auditory nerve springs, sympathizes, or which excites the cerebral circulation (as often occurs in the morning after too liberal evening potations); but, as it is also a common symptom of organic disease of the auditory nerve, it may indicate a dangerous condition, or may be a prelude to complete deafness. Hence though commonly of no consequence, it is a symptom that, especially if permanent, must be carefully watched. It may be readily induced for a few hours by a large dose of quinine, salicine, or their compounds.

**Tinnon, Robert McCracken,** an American clergyman; born in Giles co., Tenn., Feb. 6, 1840; was graduated at Giles College, Pulaski, Tenn., in 1859; admitted to the bar in 1861; served in the Confederate army during the Civil War; and ordained in the Cumberland Presbyterian Church in 1873; held pastorates in Huntsville, Ala., in 1875–1877; Nashville, Tenn., in 1877–1884; Fort Wayne, Tex., in 1884–1892; and Lincoln, Neb., after 1892. He erected two of the finest church edifices of his denomination; and was a member of the Board of Publication and the Assembly's Board of Missions in 1894–1899; president of the Church Extension Association of Illinois in 1894–1898; and vice-president of the

College Commission of the Cumberland Presbyterian Church of Illinois, Indiana, and Iowa.

**Tinnunculus,** in ornithology, an old genus of *Falconinæ,* resembling *Falco,* but with the tarsi long and strong, with transverse hexagonal scales. The species are now generally placed under *Falco* and *Cerchneis.*

**Tino,** or **Tenos,** an island of Greece, in the nomarchy of the Cylcades; immediately S. E. of Andros; area, 81 square miles. It is 18 miles long by 8 broad, and is traversed by high mountains, the terraced slopes of which yield wine, wheat, melons, figs, etc. Marble, in block or wrought into various kinds of vessels and ornaments, and silk, raw or made into gloves and stockings, are the chief exports. The chief town, Tino, on the S. coast, is the seat of a Roman Catholic bishop, has two Roman churches, and a small harbor. To the N. of it is the white marble church of Penagia Evangelistria, a famous resort of pilgrims.



RESTORATION OF SKELETON OF TINOCERAS INGENS.

**Tinoceras,** or **Tinotherium,** a genus of mammals now extinct, found in the Eocene, and representing the order *Dinocerata.* The individuals were all large, some of them nearly equaling the elephants, while the brain was smaller than that of any living or fossil mammal.

**Tinospora,** in botany, a genus of *Menispermaceæ* tribe Heteroclineæ. Male flowers with six free stamens; ovules curved; seeds peltate; cotyledons spreading. Climbing Indian shrubs. *T. cordifolia,* formerly *Cocculus cordifolius,* is the Gulancha. The roots and stems are used as an antidote to the bites of poisonous serpents and of insects, also as a tonic, antiperiodic, and diuretic. *T. crispa,* found in Sylhet, is believed to have the same qualities.

**Tin Plate.** The manufacture of this article forms a branch of the iron trade. The art of tinning plate iron is said to have been invented in Bohemia, about the beginning of the 16th century, though the tinning of copper was known earlier. Tin plate was first made in England about 1670. Sheet iron for tin plates is made either of charcoal bar or coke bar, which has been rolled with particular care, in order to avoid scales on the surface. Before tinning the plates are called "black plates." When the iron has been cut to the required size the plates are "pickled"—*i. e.,* they are immersed in hot sulphuric or hydrochloric acid which has been diluted by 16 parts of water to 1 of acid, the use of the acid being to remove all oxide. After this the plates require to be washed several times in water, and then annealed. The plates are next passd two or three times through chilled iron rollers highly polished with emery and oil, to give them a well-polished surface. Once more they are sent to the annealing furnace, passed again through dilute sulphuric acid, which is followed by another washing, but this time in running water, and then scoured with sand. This should leave them quite clean and bright.

Each plate is now put singly into a pot of melted grease (which has become sticky by use), and left till it is completely coated, after which the plates are taken in parcels and plunged into a bath of melted tin covered with grease, called the "tin pot." The plates are afterward put in parcels into the first of the two compartments

of a vessel, where they receive a coating of purer tin than that of the "tin pot," and are then withdrawn one by one, and wiped on both sides with a hemp brush, the marks of which are obliterated by another dipping in the second compartment of the "wash pot." This last dipping also gives the plates a polish. The superfluous tin is removed by immersing the plates in a pot containing tallow and palm oil, maintained at a temperature just high enough to allow the tin to run off. The final treatment consists in working the plates separately in troughs of bran with a little meal, and then rubbing them with flannel. Of late years tin plates of mild steel have been manufactured, and for some purposes they are preferred to iron tin plates.

There is a variety of tin plates called "terne plates," coated with an alloy of tin and lead, in which the proportions vary from 1 of lead and 2 of tin to 2 of lead and 1 of tin. Now "tin plates" are frequently made of steel.

The manufacture of tin plates is chiefly carried on in South Wales and in the United States. In 1890 the total exports from Great Britain amounted to 421,797 tons, valued at $31,807,385; of this quantity 321,109 tons were sent to the United States. By the McKinley tariff of 1890 a high protective duty (2.2 cents per pound; lowered to 1.2; and again increased in 1897) was imposed on tin plates imported into the United States, in order to protect the manufacture there. In 1895 English exports were 366,120 tons, value $21,195,965.

According to the census of 1905 there were in the United States 36 establishments engaged in the manufacture of tin and terne plate, employing $10,813,239 capital and 4,847 persons; paying $2,383,070 for wages and $31,375,714 for materials; and having an aggregate output valued at $35,283,360.

**Tin Salt,** $SnCl_2,2H_2O$; the hydrated chloride of tin, produced by dissolving tin in hot hydrochloric acid. It crystallizes in needles, freely soluble in water, and is extensively used as a mordant in dyeing and calico printing.

**Tintagel** (-tä'jel) **Head,** a cliff 300 feet high on the W. coast of Cornwall, about 22 miles W. of Launceston, and but 6 miles from Camelford — the Camelot of Arthurian legend. Partly on the mainland and partly on the so-called island, almost cut off by a deep chasm from the rest of the promontory, stand the imposing ruins of the castle where King Arthur held his court. His spirit still hovers around the scene of his splendor in the form of the red-legged chough, a beautiful Cornish bird already rare in Leland's time. The oldest part of the existing ruins is the keep, apparently of a Norman construction, but there need hardly be a doubt that a Saxon, and perhaps earlier a British stronghold occupied the same site. The castle was still habitable in 1360, when we read of its being provisioned.

**Tint Drawing,** a method of expressing varied materials (architectural drawings) and varying surfaces and planes (perspective drawings) by means of tones or tints of water colors. It is a term applied to drawings made for purposes of illustration to distinguish between drawings made by means of the brush and drawings made entirely with the pen or pencil.

**Tintern Abbey,** a famous abbey in Monmouthshire, England, on the right bank of the Wye river; 5 miles to the N. of Chepstow; was founded for Cistercian monks in 1131 by Walter, second son of Richard Fitz-Gilbert de Clare. Rebuilt by Roger de Bigod (1269–1288), it is an excellent example of the Transition style from Early English to Decorated, the most striking features of its cruciform church (228 by 150 feet) being the central belfry arches, and four great windows with their lace-like tracery. The dismantling of the abbey followed close on the dissolution (1337), when the ruins were granted to the ancestor of the Dukes of Beaufort.

**Tin Tetrachloride,** $SnCl_4$; stannic chloride; a thin, colorless, mobile liquid obtained by distilling a mixture of powdered tin and corrosive sublimate. It boils at 120°, fumes in the air, and, when mixed with water, solidifies to a soft mass called butter of tin.

**Tinto, Dick.** See GOODRICH, FRANK BOOT.

**Tintoretto, Il,** a Venetian painter; real name JAÇOPO ROBUSTI; received his well-known surname from the fact of his father being a dyer (*Tintore*); born in Venice in 1512. He studied for a few days under Titian, but soon deserted the studio of the master for some unknown reason, and subsequently became a devoted student of antique sculpture, of anatomy, and of the works of Michael Angelo. On the walls of his studio he inscribed the ambitious motto, "*Il disegno di Michelangelo ed il colori di Tiziano,*" and such was the ardor and rapidity of his labor, reflected in the intensity of his style, that he acquired the nickname of Il Furioso. It was admitted by Sebastian del Piombo that Tintoretto could paint as much in two days as he could in as many years. The palaces and churches of Venice were rapidly adorned by him with vivid representations of historical, mythological, and scriptural subjects, but only a few of his frescoes survive. The only works said to bear his name are: "The Crucifixion," in the Scula di San Rocco (engraved by Agostino Caracci), the "Miracle of the

Slave" in the Academy, and the "Marriage of Cana" in the Church of Santa Maria della Salute. His largest work, "Paradise," on the ceiling of the library in the Doge's palace, is 84½ feet by 34, and contains upward of 100 figures. Other famous works are "Belshazzer's Feast," the "Tiburtine Sibyl," "Last Supper," "Worship of the Golden Calf," "Last Judgment," and "Slaughter of the Innocents." About a third of his works are symbolical, and he frequently makes ingenious use of the winged lion of St. Mark. He certainly belongs to the greatest class of painters in the sense that he is neither ideal nor atrabiliar, but intensely faithful in his treatment of nature. His genuine love of brilliant color he somewhat sacrificed to an overweening estimate of the value of chiaroscuro, which latterly made him pronounce "black and white the finest of all colors. The vehemence of his execution has given rise to the objection that his art lacks refinement, but, as Ruskin remarks, the stroke of Tintoretto, in the eyes of the ignorant a mere violent dash of color, is, though the work of an instant, modulated to the utmost degree of delicacy. Daring and passionate in imagination, Tintoretto sought to vary by dramatic movement the romantic motives of the Venetian school, and brought to perfection the poetry of chiaroscuro with something of Angelo's sublimity. Tintoretto died in Venice, May 31, 1594. His favorite daughter, MARIETTA, who was an excellent portrait painter, died in 1590, but his son, DOMENICO, also a painter, lived till 1637.

**Tin Trichloride,** $SnCl_3$; stannoso-stannic chloride; produced by dissolving tin sesquioxide in hydrochloric acid. It is only known in solution, and acts like a mixture of dichloride and tetrachloride.

**Tinworth, George,** an English artist in terra-cotta; born in London, England, Nov. 5, 1843. He was the son of a poor wheelwright, and while working in his father's shop took to wood carving of his own accord. In 1861 he found opportunity to get lessons in an art school at Lambeth, and in 1864 entered the Royal Academy schools. He soon began exhibiting figures and groups of figures at the Royal Academy, and in 1867 obtained a permanent appointment in the great Doulton art pottery. The works by which he became famous were mainly terra-cotta panels with groups of figures in high relief illustrating scenes from sacred history, which happily combine grace, strength, and divinity with originality of design, dramatic effectiveness, and devout feeling. An important example is the reredos in York Minster, with 28 terra-cotta panels.

**Tip Battery,** in electro-magnetism, a battery in which the vessel turns on a horizontal pivot, so that the pairs of plates may be immersed in or raised clear of the liquid in the trough by tilting.

**Tippecanoe,** a river of Indiana, which rises in the N. part of the State, flows W. S. W. and S. 200 miles, and empties into the Wabash 10 miles above Lafayette. It is famous for the battle fought near its mouth, Nov. 7, 1811, in which the Indians, under Tecumseh's brother, the prophet, were defeated by General Harrison.

**Tipperah,** a British district and also a native State in political connection with Bengal, India, on the N. E. frontier. The district of Tipperah, which lies between the hills and the Meghna river, has an area of 2,655 square miles. It is a flat plain, intersected with numerous watercourses; and produces abundant crops of rice, jute, and betel nuts. There are manufactures of weaving, pottery, and mats. The capital is Comillah. Pop. of district, about 1,500,000. The State of Tipperah, which lies E. among the hills, has an approximate area of 3,876 square miles. The products are rice, cotton, timber, and elephants. The present rajah is an enlightened man, an amateur photographer, and a student of physical science. A British political agent has resided at his court since 1871. Pop. of State, about 100,000.

**Tipperary,** a county of Ireland, province of Munster, surrounded by King's County, Queen's County, Kilkenny, Waterford, Cork, Limerick, Clare, and Galway; area, 1,659 square miles. It lies in the basin of the Suir, which rises in the N. of the county and forms part of the S. boundary before passing through Waterford to the sea. The surface, for the most part level, is diversified by hill ranges, of which the chief are the Galtees (3,015 feet), Knockmeledown (2,150 feet), Slievenaman (2,364 feet), the Devil's Bit (1,600 feet), the Keeper (2,278 feet), and Slievenamuck (1,215 feet). The Shannon and Lough Derg form part of the W. boundary, separating Tipperary from Galway and Clare; and other streams which water it are the Brosna, Nenagh, and Mulkear. There are many small lakes, and among the more fertile districts are the plain of Ormond and Golden Vale. The prevailing rocks are clay, slate, greywacke, sandstone, and limestone; and among the minerals are anthracite, coal, copper, zinc, and lead mixed with silver. The soil, calcareous loam, is in parts singularly productive. The crops include potatoes, oats, wheat, turnips, and mangelwurzel. Clonmel is the chief town. There are numerous antiquities, including the Holy Cross Abbey at Cashel, and Cahir Castle. The Mitchellstown caves, on the border of Cork, are of great extent and

contain fine stalactite deposits. Pop. (1901) 160,232.

**Tipperary** (Irish Gaelic, Tiobrad Arann, "the well of the district of Ara"), a market town in the county of the same name; on the Arra, an affluent of the Suir; 24½ miles N. W. of Clonmel and 110 S. W. of Dublin. Lying at the base of the Slievenamuck Mountains, near the center of the Golden Vale, on the direct road from Clonmel to Limerick, it carries on a considerable trade in butter, corn, flour, etc. The daily butter market is said to be next in importance to that of Cork. Tipperary is the headquarters of the Union Agricultural Society, and it has a spacious corn and provision market, in which markets are held on Thursdays and Saturdays. There is a fine parish church, a Gothic Roman Catholic church with a spire 156 feet high, a Presbyterian church, a Methodist chapel, a town hall, etc. Pop. about 6,000.

**Tippoo Sahib,** more correctly, TIPÚ SULTAN, Sultan of Mysore, and son of Hyder Ali; born in 1749. Efforts were made to carefully instruct him in the various branches of learning cultivated by Mohammedans; but Tippoo much preferred the practice of athletic exercises, and the companionship of the French officers in his father's service, from whom he acquired a considerable acquaintance with European military tactics. This knowledge he put to effective use during his father's various wars, by completely routing Colonel Bailey (1780 and 1782), and Colonel Braithwaite on the banks of the Coleroon (1782) though these were his only important engagements with the British forces in which he could boast of success. On the death of his father he was crowned with little ceremony, returning at once to the head of his army, which was then engaged with the British near Arcot. In 1783 he captured and put to death most of the garrison of Bednur; but news of the peace between France and England having reached his French allies, they retired from active service, and Tippoo ultimately agreed to a treaty (1784) stipulating for the *status quo* before the war.

During the continuance of this peace he occupied himself in regulating the internal administration of Mysore, sent ambassadors in 1787 to France to stir up a war with Great Britain, and failing in this, at length so far allowed his inveterate hatred of the English to overcome his judgment as to invade (1789) the protected State of Travancore. In the ensuing war (1790–1792) the British, under Colonel Stuart and Lord Cornwallis, were aided by the Mahrattas and the Nizam, who detested their powerful and aggressive neighbor; and though the tactics of the Sultan in laying waste the Carnatic almost to the very gates of Madras baffled his opponents for a time he was ultimately compelled (1792) to resign one-half of his dominions, pay an indemnity of 3,030 lakhs of rupees, restore all prisoners, and give his two sons as hostages for his fidelity. Nevertheless his secret intrigues in India against the British were almost immediately resumed; another embassy was sent to the French; and the invasion of Egypt by the latter in 1798 and Tippoo's machinations having become known to the governor-general almost simultaneously, it was resolved to punish the perfidious Sultan. Hostilities commenced in March, 1799, and two months after Tippoo was driven from the open field, attacked in his capital of Seringapatam, and after a month's siege slain in the breach at the storming of the fort (May 4). He was buried, during an appalling thunderstorm, in the mausoleum he had built for his father. His government of Mysore after 1792 was most oppressive, yet Tippoo was extremely popular, and was esteemed by the Mohammedans as a martyr.

**Tippoo Tib,** a famous Arab trader in Central Africa. He accompanied Stanley on the occasion of the latter's second expedition to Africa from Nyangwe to the banks of the Lualaba; in 1887 Stanley appointed him Governor of Stanley Falls Station, a stated salary being guaranteed him; he also assisted Stanley in his search for Emin Bey in 1887–1889.

**Tipula,** the crane fly, the typical genus of *Tipulidæ*. The antennæ have all the articulations but the second almost cylindrical; the second globular. About 50 species are known from Europe. *T. oleracea* is the very common species called by children daddy long-legs. It is about an inch long, hoary brown, with four brown streaks on the thorax; the legs brownish-yellow, the thighs, tibiæ, and tarsi blackish toward their ends. It deposits about 300 shining black eggs in or on the ground. The larvæ, called grubs and leather-jackets, are dingy gray or brownish worms destitute of feet; they feed on the roots of grasses and other plants, and are often very destructive. When full grown they are an inch or an inch and a half long. The change to the pupa state takes place underground; the pupa itself has respiratory tubes. A smaller species, *T. hortulana*, is common in gardens. The largest species in Europe is the great crane fly, *T. gigantea*, an inch and a quarter in length.

**Tipulidæ,** crane flies, a family of *Nemocera*. Antennæ longer than the head, with 13 or more joints, rarely pectinated. Compound eyes, rounded or oval; ocelli none. Front of the head beaked, proboscis short, fleshy; palpi four-jointed; abdomen and

legs long and slender; wings with numerous veins, some of them cross veins. The larvæ of most species live in rotton wood; a few are aquatic. Distribution world-wide.

**Tiraboschi, Girolamo** (tē-rä-bos'kē), an Italian historian of literature; born in Bergamo, Italy, Dec. 28, 1731. He wrote a celebrated "History of Italian Literature" (14 vols. 1772–1782); a work of wonderful erudition, accuracy, and completeness, extending from the first beginnings of modern culture in Italy down to the 18th century, and dealing with every branch of literature. Among his other writings are: "Historical Memoirs of Modena" (4 vols. 1793–1794). He died in Modena, June 3, 1794.

**Tirailleur** (ti-rä-yur'), a name originally applied in France during the Revolution of 1792 to light-armed bodies, who were thrown out from the main body to bring on an action, cover an attack, or generally to annoy or deceive the enemy; a skirmisher, a sharpshooter.

**Tire,** an iron band around the fellies of a wheel. The circular continuous tire is of American origin. In Europe tires were till lately, generally made in sections arranged to break joints with the fellies. The rim tire is expanded by heating, and then shrunk on so as to tightly compress the wheel, and bolted; in the sectional tire, bolts only are relied on to hold the parts together. Steel railway tires are always of the former kind. India-rubber wheel tires, solid and pneumatic, are used on bicycles, automobiles, ambulances, light vehicles, and steam fire engines, for the purpose of decreasing the jar on the vehicle, and as a means of increasing the tractive adherence.

**Tiree, or Tyree,** an island of the Hebrides, belonging to Argyleshire. It is about 14 miles long, and reaches 6 in breadth, is generally low, flat, and fertile, but has several heights of 400 feet. Agriculture and fishing are the leading industries.

**Tirebuck, William Edwards,** an English writer; born in Liverpool, England, in 1854. For some years connected with the Liverpool "Mail" and "Yorkshire Post," he afterward devoted himself to writing novels; the most popular are: "Saint Margaret" (1888); "Dorrie" (1891); "Sweetheart Gwen" (1893); "Miss Grace of All Souls" (1895); "Meg of the Scarlet Foot" (1898); "The White Woman" (1899). His other writings include "Dante Gabriel Rossetti" (1882), and "Great Minds in Art" (1888). He belonged to the "Liverpool group" of English authors, including Hall Caine, William Watson, and Richard Le Gallienne. He died Jan. 22, 1900.

**Tiresias** (tī-rē'shius), in Greek mythology, a famous prophet, who, according to one legend, was struck blind by the goddess Athena, because he had seen her bathing. Another legend represents Hera as depriving him of his sight because, being made arbiter in a dispute between her and Zeus, he had decided in favor of the latter; when Zeus as a compensation granted him the inner vision of prophecy, and prolonged his life for several generations. He is consequently prominent in many of the mythical stories of Greece, but at last found death after drinking from the well of Tilphossa, Tiresias is the theme for a fine poem by Lord Tennyson (1885).

**Tirlemont** (tēr-le-mô*ng'*); a town of Belgium; in South Brabant, on the Great Geete, 30 miles E. S. E. of Brussels. It has two fine churches of the 12th and 13th centuries, and manufactures of machinery, hosiery, flannel, leather, sugar, etc. Once a large and prosperous city, Tirlemont was ravaged by Marlborough in 1705; and here the French, under Dumouriez defeated the Austrians in 1793. Pop. about 17,000.

**Tiro,** Cicero's servant and amanuensis; lived about 95 B. C.–A. D. 5; was emancipated by Cicero, and even treated by him as a friend and co-worker; some of Cicero's letters to him are extant. He invented a system of shorthand, called from him "Notæ Tironianæ" (Tironian Notes).

**Tirnova,** a town of Bulgaria, on the Jantra; 35 miles S. S. E. of Sistova; amid strange limestone rocks. It became in 1235 the seat of the Bulgarian patriarch, and has more than once served as the capital. Dyeing is carried on, silk and coarse cloth are manufactured. Pop. (1893) 12,858.

**Tiryns** (tī'rinz), or **Tirynthus,** one of the oldest cities of ancient Greece, in Argolis, 2 miles from Nauplia. It was celebrated for its massive walls, which were popularly attributed to the Cyclops, and are the finest existing specimens of the military architecture of the heroic age of Greece. The ruins at present occupy the lowest hill of several which rise out of the plain, the S. E. part of the wall having a remarkable covered gallery, 36 feet in length, and 5 in breadth. The origin of Tiryns belongs to the mythical period, and in 468 B. C. it was entirely destroyed by the Argives.

**Tischendorf, Lobegott Friedrich Konstantin** (tish'en-dorf), a German Biblical critic; born in Lengenfeld, Saxony, Jan. 18, 1815; studied at Leipsic; and in 1845 became professor extraordinary there, becoming Professor Ordinary of Theology in 1859. He made several visits to the East, and brought back valuable MSS., the most remarkable being (in 1859) the famous SINAITIC CODEX (*q. v.*). Tischendorf was continually engaged in editorial labors, and

was broken down by overwork in 1873. He died in Leipsic, Dec. 7, 1874.

**Tisdall, Fitzgerald,** an American educator; born in New York city, March 15, 1840; was graduated at the College of the City of New York in 1859; tutor in the Free Academy, New York, in 1860; director of Cooper Union Schools of Science and Art in 1870; and Professor of Greek Language and Literature in the College of the City of New York after 1879. He lectured extensively; visited Europe several times; and was a member and councillor of the American Institute of Archæology and a member of the American Philological Association.

**Tisri,** in the Jewish calendar, the first month of the civil, and the seventh of the ecclesiastical year. It corresponded to part of our September and October. The Great Day of Atonement and the Feast of Tabernacles fell within its limits. Called in I Kings viii; 2, Ethanim (=streaming rivers), because the rivers, swelled by the autumnal rains, were then in flood. The name tisri occurs in the Palmyrene inscriptions, and was probably not confined to the Jews.

**Tissandier, Gaston** (tē-so*ng*-dyā′), a French aeronaut and chemist; born in Paris, France, Nov. 21, 1843. Besides textbooks of chemistry, he wrote for the "Library of Wonders," volumes on "Water," "Coal," "Fossils," "Photography," and, in collaboration with others, "Aerial Voyages." He died Sept. 8, 1899.

**Tissot, Claude Joseph** (tē-sō′), a French philosopher; born in Fourgs, Doubs, Nov. 26, 1801. He translated most of Kant's writings into French. Among his original works are: "Of the Beautiful, Especially in Literature" (1830); "Short History of Philosophy" (1840); "The Mania of Suicide and of Revolt" (1840); "Parceling of the Land and Division of Property" (1842); "Principles of Morality" (1866); "Catholicism and Public Instruction" (1874); "Insanity Considered Especially in its Relations to Normal Psychology" (1876). He died in Dijon, Oct. 7, 1876.

**Tissot, Pierre François,** a French historian and miscellaneous writer; born in Versailles, France, in 1768. Among his works are: "Reminiscences of Prairial 1st to 3d" (1799), an interesting page of French history; "Vergil's Bucolics," in French verse (1800); "The Three Irish Conspirators; or, Emmet's Shade" (1804); "The Wars of the Revolution to 1815" (1820); "Vergil Compared with Ancient and Modern Poets" (4 vols. 1825–1830); "Complete History of the French Revolution" (6 vols. 1833–1836). He died in 1854.

**Tissue,** a very fine transparent silk stuff used for veils; white or colored. It was formerly interwoven with gold or silver threads and embossed with figures. Also a very thin kind of paper and cloth interwoven with gold. In entomology, a European geometer moth, *Scotosia dubitata.* The fore wings have numerous transverse wavy lines; the larva feeds on buckthorn.

In histology, a set of cells modified for the performance of a special function; the fabric of which the organs of plants and animals are composed. The structure of tissues, with very few exceptions, is imperceptible to the unassisted eye, and requires the aid of the microscope for its resolution. Tissues which are absent from plants occur in animals; these are called animal tissues, and have a relation to movement or to sensation, as the muscles and nerves. But plants preserve, protect, and sustain themselves, and the corresponding tissues in animals are spoken of as the vegetable tissues; of this kind are epithelium and bone. Tissues always present the same general arrangement in the same organism, but are combined in different ways in different organisms. In the lower forms of life, whether animal or vegetable, the distinctions between tissues become less and less obvious, and there are organisms so extremely simple that the tissue of their bodies is of a uniform cellular character.

*Animal Tissues.*—The term tissue is used in dealing with (*a*) the structure of organs, which are composed of various tissues; and (*b*) specially of the component parts of organs. In the first and wider sense, the anatomical individual is made up of osseous tissue, or bone; muscular tissue, or flesh; adipose tissue, or fat; cartilaginous tissue, or gristle; connective tissue, serving to bind the whole together; and pigmentary tissue, or coloring matter. In dealing with animal tissues in the strict sense, histological analysis shows them to be much more differentiated and elaborate in structure than those of plants. They may be divided into (*a*) Epithelium, consisting of nucleated protoplasmic cells, forming continuous masses, either arranged in a single layer, or stratified and forming several superimposed layers. The lining of the tubes and alveoli of secreting and excreting glands, and the sensory or terminal parts of the organs of sense consist of epithelium. (*b*) Connective tissue, a name applied to a variety of tissues developed from the same embryonal element, serving more or less as framework or connecting substance for nervous, muscular, glandular, and vascular tissues. In the embryo and in the growing condition one may be changed into the other, and in the adult they gradually shade off one into the other. These tissues are divided into three groups,

in all of which the ground substance, matrix, or intercellular substance is distinguished from the cells embedded therein: (i) Fibrous connective tissue, consisting of microscopic, band-like, or cylindrical bundles of exceedingly fine homogeneous fibrils, sometimes aggregated in groups, and held together by an albuminous, semi-fluid cement substance called globulin. (ii) cartilage, consisting of a firm ground substance with cells imbedded therein. Cartilage may be hyaline, having the ground substance firm and resembling ground-glass; fibrous, or fibro-cartilage, consisting of fibrous connective tissue arranged in bundles, and these again in layers; and yellow, elastic, or reticular, having the ground work permeated by dense networks of elastic fibrils. (iii) Bone and dentine, both developed from transformed embryonal connective tissue. (*c*) Muscular tissue: (i) Non-striated, consisting of nucleated cells, contractile in one definite direction, becoming shorter and thicker during contraction. (ii) Striated, composed of extremely long more or less cylindrical fibers, held together by bundles of fibrous connective tissues so as to form larger or smaller bundles; these again are aggregated together by stronger bands and septa of fibrous connective tissue, and these into the fascicles or divisions of an anatomical muscle. (*d*) Nervous, consisting of bundles of nerve fibers held together by fibrous connective tissue, which carries the blood vessels supplying the nerve trunk, a plexus of lymphatics, groups of fat cells, and sometimes numerous plasma cells.

*Vegetable Tissues.*— Two forms of aggregations of cells, called generally cellular tissue, may be distinguished, according to the form and relative position of the cells which compose them: (*a*) Parenchyma (areolar, utricular, or vesicular tissue), in which thin-walled cells, of a diameter nearly equal in all directions, are united to one another by broad surfaces; and (*b*) prosenchyma, in which the cells are pointed at both ends, and are much longer than they are broad. When the walls of the cells are much thickened, the tissue is called sclerenchyma; this may be either parenchymatous or prosenchymatous, according to the form of the cells. When the transverse walls of a row of superimposed cells are absorbed or perforated, so that they coalesce and form tubes or vessels, the tissue is said to be vascular. When all the cells have ceased to divide, and have assumed their definite form, the tissue is called permanent; when, on the contrary, the cells are still dividing, it is called generating tissue. When several different tissues occur in one plant, as in all the higher plants, they are arranged into systems. Three such systems of tissues are usually met with: (1) The epidermal, which covers the exterior of the plant, and usually consists of a single layer of cells; (2) the fibro-vascular, which traverses the body of the plant in the form of bundles, and is characterized by the presence of tubes and vessels, and of long, pointed, prosenchymatous cells — the wood fibers; (3) the fundamental tissue, which fills up the rest of the space, and consists principally of parenchyma.

**Tisza, Koloman Borosjeno von,** a Hungarian statesman; born in Geszt, Hungary, Dec. 16, 1830; was educated for the civil service; devoted much time to travel; was elected to the Hungarian Parliament in 1860; and later became leader of the Moderate Radicals, which party he united with the Liberals in 1875. He was appointed Minister of the Interior in the same year and prime minister in 1876. In 1876–1878 he opposed the policy of Russia and Pan-Slavism, and resigned with his cabinet when the financial condition of the Austrian government was found to be insufficient to meet the expense of the Bosnian occupation. Subsequently, however, he resumed this office, and held it till 1890, when he resigned. He died in Budapest, Hungary, March 23, 1902.

**Titanic Acid,** $H_2TiO_3$; a white powder obtained by adding ammonia to titanic chloride. It is soluble in sulphuric, nitric, and hydrochloric acids, and forms with the metals and alkaline earths, salts called titanates.

**Titanic Chloride,** $TiCl_4$; a colorless, transparent heavy liquid, prepared by passing chlorine over an ignited mixture of titanic oxide and charcoal. Sp. gr. 1.7609 at 0°; boils at 135°, and emits white fumes on exposure to the air.

**Titanic Oxide,** $TiO_4$; occurs native in three different forms, viz., as rutile and anatase, in which it is dimetric, and as brookite, in which it is trimetric. It is insoluble in water and in all acids, except strong sulphuric acid.

**Titaniferous Iron-sand,** in mineralogy, a variety of Menaccanite, occurring in small grains, sometimes in extensive deposits, resulting from the degradation of igneous rocks.

**Titania** (Latin = a name of Latona, as daughter of the Titan Coius; of Pyrrha, as a descendant of the Titan Prometheus; of Diana as the sister, and of Circe as the daughter of Sol. Shakespeare uses the name for the wife of Oberon), in astronomy, the third of the four satellites of Uranus. Its mean distance from the center of the planet is 272,000 miles, its periodic time 8.705897 days.

**Titanite,** a mineral occurring mostly in crystals, rarely massive. Crystallization,

monoclinic; hardness 5–5.5; sp. gr.3.4–3.56; luster, admantine to resinous; color, shades of brown, yellow, green, gray, black; streak, white; transparent to opaque; brittle. Composition: A silico-titanate of lime, with the formula $(CaO + TiO_2)SiO_2$. Dana distinguishes the following varieties: (1) Ordinary: (*a*) titanite, brown to black; (*b*) sphene, yellow, and of light colors, and translucent. (2) Manganesian, greenovite. (3) Crystallographic, depending on the direction in which the crystal is elongated, and hemimorphic forms. Occurs in granite, gneiss, mica-schist, syenite, etc., also in beds of iron ore, and sometimes in volcanic rocks. Enormous crystals of the brown variety (lederite) have been found (1885) at Renfrew, Canada, sometimes weighing as much as 72 pounds.

**Titanium,** a very rare metallic element, discovered by Gregor in 1789. Symbol Ti; at. wt. 50. It is never found in the metallic state, but may be obtained by heating the double fluoride of potassium and titanium with potassium in a covered crucible, or by mixing titanic oxide with one-sixth of its weight of charcoal and exposing to the strongest heat of an air furnace. It is a dark-green, heavy, amorphous powder, having under the microscope the color and luster of iron. It dissolves in warm hydrochloric acid, with evolution of hydrogen, and, when heated in the air, burns with great splendor. Like tin, it forms two classes of compounds — the titanic, in which it is quadrivalent, and the titanous in which it is trivalent. The spectroscope shows that there is titanium in the sun.

**Titanomorphite,** a white mineral, isomorphous with titanite. Results from the alteration of rutile and menaccanite, the grains or crystals of which it incloses. An analysis showed: Titanic acid, 74.32; lime, 25.27; protoxide of iron, a trace, which corresponds to the formula, $CaTi_2O_5$. Found in the hornblende schists of the Hohe Eule, Lampersdorf, Silesia.

**Titanosaurus,** in palæontology, a synonym of *Atlantosaurus*, the type genus of the family *Atlantosauridæ* of Marsh's order *Sauropoda*. In the family the ischia are directed downward, with expanded extremities meeting on the median line; anterior caudal vertebræ with lateral cavities. The species of the type genus are gigantic dinosaurians, but the least specialized forms of the sub-class, in some respects approaching Mesozoic crocodiles. *A. montana*, from the Upper Jurassic of Colorado, according to Marsh, "is by far the largest land animal yet discovered, its dimensions being greater than was supposed possible in an animal that lived and moved on the land. It was some 50 or 60 feet in length, and when erect, at least 30 feet in height. It doubtless fed on the foliage of the mountain forests, portions of which are preserved with its remains."

**Titanotherium.** See BRONTOTHERIUM.

**Titanous Chloride,** $Ti_2Cl_6$; produced by the action of hydrogen on titanic chloride. It forms dark violet scales, having a strong luster, deliquesces in the air at ordinary temperature, and dissolves in water, forming a violet-red solution.

**Titanous Oxide,** $Ti_2O_3$; a black powder obtained by heating titanic oxide in hydrogen. It is almost insoluble in nitric and hydrochloric acids, but dissolves in sulphuric acid, forming a violet-colored solution.

**Titans,** in Greek mythology, were six sons and six daughters of Uranos and Gaia, named Okeanos, Koios, Kreios, Hyperion, Iapetos, and Kronos; Theia, Rhea, Themis, Mnēmosnynē, Phoibē, and Tethys. Uranos having banished to Tartarus the Hekatoncheires ("the hundred-handed") and the Cyclōpes, Gaia called the Titans to avenge their brothers. They rose and freed them, deposed Uranos, and set Kronos in his place. Kronos and the Titans were in their turn put down by the sons of Kronos and Rhea, named the Olympioi, with Zeus at their head, but not till after a long struggle, in which Zeus brought to his aid the Cyclōpes and Hekatoncheires, whom Kronos had again imprisoned in Tartarus. Zeus quelled the Titans with the lightning given him by the Cyclōpes, hurled them to Tartarus, placing them under the care of the Hekatoncheires. This struggle, called the Titanomachia, was regarded as symbolic of the conflict of reason and order with the rude forces of nature.

**Tithe,** etymologically a 10th, historically a 10th part of the titheable produce of the land paid to the clergy. The payment of tithe to the clergy originated in the recognition of a moral and religious duty. The discharge of this acknowledged obligation acquired the force of custom, then received the sanction of ecclesiastical law, and finally passed into the national jurisprudence of England and other Christian countries.

The first recorded instance of the payment of tithe is the offering of Abraham to Melchisedec (Gen. xiv: 20); the second precedent is the vow of Jacob at Bethel (Gen. xxviii: 22). The consecration of a fractional portion of the produce of the land to the uses of the ministers of religion formed part of the Mosaic law. The tribe of Levi were maintained from this source, not having lands assigned to them like the other tribes. Neither patriarchal usage, nor precedents of Mosaic law, nor the Levitical economy were binding on Christians; but they doubtless suggested to the clergy the precept, and to the people the practice,

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of paying tithes to the ministers of religion. The system is not specially enjoined in the New Testament, and no claim to tithes is urged by the Christian clergy as representatives of the Levitical priesthood. In the enthusiastic bounty of early Christianity voluntary offerings sufficed.

Some evidence does exist in the ante-Nicene Fathers that tithes were held to be due under the Gospel as well as under the Mosaic law; on the other hand, Selden is possibly right in maintaining that the custom of paying tithe cannot be traced before the 4th century. Whether this be so or not is immaterial. At the end of the 4th century the evidence is overwhelming (Hilary, Ambrose, Chrysostom, Jerome, Augustine) that the moral and religious duty of paying tithes was recognized, and had acquired the force of custom. As a moral and religious custom the payment of tithes was enjoined by the public acts of councils and churches, and enforced by moral and religious sanctions (*e. g.*, Councils of Tours, 567; Macon, 589; Rouen, 650; etc.). The last stage was reached when the state added the civil sanction to the ecclesiastical sanction. In doing so the state recognized the already accepted customary duty, and the corresponding customary rights. It created no new burden; it appropriated no part of what had hitherto been a public fund or public revenue. On the Continent the attachment of legal sanctions to ecclesiastical customs dates from Charlemagne's legislation in 779 and 787. Henceforward tithes were enforced by temporal penalties.

Before Augustine landed in Kent (597), the custom of paying tithes had been enjoined by the public acts of continental councils. As a duty the payment of tithes was preached by the first missionaries; as a custom it was speedily established by their successors. But it was not till 785 that the custom was enjoined by ecclesiastical legislation. In 785 two Italian bishops were sent by Pope Adrian I. to recommend 29 Latin injunctions to the observance of the Anglo-Saxon Church. Among them was one injunction which urged the payment of tithes as a means of securing to the payer the blessing of God. Thus the customary discharge of a recognized religious duty was for the first time enforced in England by the public act of an ecclesiastical council.

This ecclesiastical injunction was subsequently confirmed and extended by royal orders in Episcopal councils, in national synods, and in proclamations of peace. But it was not till 970 that the state recognized the customary duty and its corresponding customary right by adding the civil to the ecclesiastical sanction. It is now agreed that the so-called grant of King Offa is an idle story relating to Peter's pence, and that the so-called grant of King Ethelwulf rests on a misconstruction of a document which has no reference to tithes. No law, no charter, no authentic public document exists by which the state professes to confer the rights to tithes upon the Church. But the laws of King Edgar (970) attached a legal punishment to neglect of the customary and religious duty of paying tithes, and provided means of enforcing the corresponding customary right by temporal penalties. These laws were subsequently confirmed by successive sovereigns, though it was not till after the Conquest that the payment became general. The process by which tithes grew from a moral into a legal duty does not explain their special allocation as the local endowments of parishes. In their appropriation as part of the parochial system three stages may be distinguished: (1) before 970; (2) from 970 to the end of the 12th century; (3) from 1200 onward.

(1) *Before 970.*— During the first three centuries of the Anglo-Saxon Church there was in each diocese one common treasury, into which were paid the tithes and other offerings of the faithful. As to the distribution of these funds by the bishop, different usages prevailed in different parts of Western Christendom. In the Roman dioceses the customary division was fourfold: (1) the clergy, (2) the poor, (3) the fabrics of churches, (4) the bishop. In some of the French and Spanish dioceses the division was threefold, the bishop being omitted. What usage prevailed in the Anglo-Saxon Church is unknown. No division, quadripartite or tripartite, was ever enjoined by law or canon in England.

(2) *From 970 to End of 12th Century.*— In this transition period the parochial system grew up, and local appropriations were made to particular churches out of the common fund. Edgar's legislation (970) shows that the parochial system was already growing. His legislation points to the fact that landowners were building churches on their estates for their own and their tenants' benefit, and were endowing them with some portion of the tithe, which they otherwise paid to the diocesan treasury or to the nearest monastic or conventual establishment. It distinguishes three kinds of churches: (1) the mother church, generally monastic or conventual; (2) churches with burial grounds attached, in private patronage on the estates of private landowners; (3) churches similarly situated, but without burial grounds. It recognizes the general presumption in favor of paying to the mother church the tithe of the district which it served, but if there was a church of the second class within the district it was entitled to a portion of the local tithe. In these churches we have the

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original type of modern parish churches. By degrees they multiplied, and, as they were built, bishops insisted on their endowment with a portion of the local tithe as a condition of consecration. Districts were attached to them, which were generally conterminous with the estate of the founder, and which became the parish. The same process was going on not only on lay estates, but on the estates of bishops and other ecclesiastical corporations. Thus the parochial system gradually became uniform, and by a series of acts, which in each case were distinct and voluntary on the part of the landowner, the local tithes became appropriated without any legislative enactment to parish churches. No general law, no legislative enactment, effected the endowment; but by express particular grants, of which, in the shape of consecration deeds, several remain to the present day, each church was separately endowed.

(3) *From 1200 Onward.*—This date makes a dividing line in the growth of the parochial system, because by that time the system was almost universal, and because the legal presumption had arisen that, in the absence of proof to the contrary, the tithes of all titheable produce within the parish belonged of common right to the rector. The decrees of the Lateran Council, 1179–1180, made two important steps, according to Selden, toward the growth of the system. Up to that date landowners had been free to pay the tithes as they pleased; they might, and did, "appropriate" them to churches, monasteries, or capitular bodies; they might "appropriate" them to themselves or other laymen; they might, and did, sell them to the Church for money or other valuable consideration. Out of this power had arisen all the endowments of parish churches and monasteries with tithes which took place between the 10th and 13th centuries. From 1180 onward no new titles of this kind could be created without the consent of the bishop, and the loss of the power of appropriation, together with the legal presumption in favor of the rector's title, provided for the expansion of the system on stereotyped lines. The other change in 1180 was this. Parish priests were originally nominated and invested by lay patrons. Bishops did not institute; hence when vacancies occurred in manorial parish churches patrons could not be compelled to fill them up. The council decreed the necessity of Episcopal institution, and established the right of the bishop to supply vacancies after the lapse of a certain delay. The almost universal establishment of the parochial system, the legal presumption in favor of the rector, the Episcopal institution, and the bishop's right to supply vacancies completed the organization of parishes and provided for present and future appropriations of local tithes to parish churches.

Rectories together with tithes might be "appropriated" to monastic or non-parochial corporations. The appropriators performed their duties by vicars. At the dissolution of the monasteries the rectorial tithes which had belonged to the dissolved communities passed to the crown, and were from time to time granted out to subjects, who became lay rectors or "impropriators" as they were called to distinguish them from the original "appropriators," who must of necessity have been spiritual. The Tithe Commutation Act of 1836 provided for the commutation of tithes in England and Wales into a money payment or rent charge. Though the annual payment varies with the septennial average price of corn, it is fixed in the sense that the amount payable in each year is calculated on a rent charge or fixed valuation. The effect of this act is to render the old distinctions between great and small tithes, prædial, mixed, and general tithes, and between the various modes of payment by "moduses" matters of antiquarian knowledge. The value of the tithes commuted in 1836 to tithe rent charge was at par value £4,053,985, 6s. 8½d. Of this sum £962,-289, 15s. 7¼d. is payable to lay impropriators, leaving £3,091,695, 11s, 1¼d. for ecclesiastical owners. Of this latter sum £678,987, 1s. 1¾d. is payable to Ecclesiastical Commissioners. The remainder, £2,-412,708, 9s. 11½d., is payable to parochial incumbents. At the present values this sum is worth about in round numbers £1,800,-000. To this sum may be added about £8,000 for extraordinary tithe in Kent and Cornwall. In Ireland the settlement was effected by a general commutation of tithe into a money rent charge, regulated by a valuation of the tithes (one-fourth being deducted for the cost of collection), and payable by the proprietors, who should receive it from the occupiers of the land. By the Irish Church Act, 1869, this rent charge became vested in the commissioners of church temporalities, with power to sell such rent charge to the owner of the land charged therewith at 22½ years' purchase. Power is also given to such purchaser to pay by instalments for 52 years, at the rate of 4½ per cent. on the purchase money, deducting the estimated charge for poor rate; the rent charge being extinguished at the expiration of the 52 years. The Extraordinary Tithe Act, 1886, frees lands not at present cultivated as hop ground. orchard, fruit, plantation, or market garden, from liability to the separate tithe which, under the Act of 1836, could be claimed as extraordinary. It also provides for the redemption of the extraordinary tithe in existence upon the land actually under culti-

vation. The Tithe Rent Charge Recovery Act of 1891 has not materially affected the principle of the act of 1836. But instead of the old remedy of distress by the tithe-owner, it substitutes a process through the county court; instead of permitting the tenant to be the conduit pipe of the landowner's payment, it makes the landowner alone liable; instead of the corn averages absolutely determining the amount of tithe rent charge which is payable, provision is made in certain cases for the reduction or the suspension of payment.

In 1891 a Royal Commission was appointed to consider the redemption of tithe rent charges. The Commission reported *inter alia* in favor of the compulsory redemption of tithes up to the value of 40s., of the abolition of the existing minimum of 25 years' purchase of the principle of allowing the parties to make their own bargains subject to the approval of the Board of Agriculture. See ADVOWSON: TEINDS.

**Tithing**, an ancient subdivision of England, forming part of 100, and consisting of 10 householders and their families held together in a society, all being bound for the peaceable behavior of each other, the chief of whom was the tithing man.

**Tithonia** (named by Destontaines from the color of its flower, which resembles Aurora, the Morning, Dawn, whose husband was Tithonus), a genus of *Coreopsideæ*. *T. tagetiflora* is the marigold flower, introduced into gardens from Vera Cruz in 1818, and since cultivated for its beauty.

**Tithonian,** in geology, a term applied to an extensive series of rocks in the W. of France, the Alps, the Carpathians, Northern Italy, and the Apennines, filling the gap between the Neocomian and the Oölite. Professor Judd thinks that it may have been of the same age as part of the Wealden. The geologists of France assign it to the lower part of the Cretaceous system, those of Austria to the Upper Jurassic.

**Tithonus** (-thō′nus), in Greek mythology, a son, or nephew, of Laomedon, King of Troy. He was beloved by Eos (Aurora, Morning), who importuned Zeus to make him immortal. Her prayer was granted, but she had neglected to ask for continual youth, and in time her lover took on all the signs of extreme age. Tithonus's prayer to the gods to be relieved of the burden of old age was answered by his being metamorphosed into a grasshopper.

**Titian** (tish′un), or **Tiziano, Vecellio,** (tēt-sē-ä′nō vā-chel′lē-ō), one of the most distinguished of the great Italian painters, and head of the Venetian school; born in Pieve de Cadore, in the Carnic Alps, in 1477. He studied under Giovanni Bellini of Venice, and in 1507 was associated with the painter Giorgione in executing certain frescoes. In 1511 he was invited to Padua, where he executed three remarkable frescoes still to be seen. In 1512 he completed the unfinished pictures of Giovanni Bellini in the Sala del Gran Consiglio at Venice, and the senate were so pleased that they gave him an important office. To this period are attributed his pictures of the "Tribute Money" and "Sacred and Profane Love." In 1514 he painted a portrait of Ariosto at Ferrara, and after his return to Venice he painted an "Assumption of the Virgin" (1516), considered one of the finest pictures

TITIAN.

in the world; it is now in the Academy of the Fine Arts in Venice. About 1528 he produced his magnificent picture, "The Death of St. Peter the Martyr"—"a picture," says Algarotti, "in which the great masters admitted they could not find a fault," unfortunately destroyed by fire in 1867.

In 1530 the Emperor Charles V. invited him to Bologna to paint his portrait and execute various other commissions. In 1532 he again painted the emperor's portrait, and he is said to have accompanied Charles to Madrid, where he received several honors. He remained, it is said, three years in Spain, in which country many of his masterpieces, such as "The Sleeping Venus," "Christ in the Garden," "St. Margaret and the Dragon," are still to be found. In 1537 he painted an "Annunciation," and in 1541 he produced "The Descent of the Holy Ghost on the Apostles," "The Sacrifice of Abraham," and "David and Goliath." In 1543 he painted his picture of "The Virgin and San Tiziano"; and in 1545 he visited Rome, where he painted the famous group of Pope Paul III., the Cardinal Farnese, and Duke

Ottavio Farnese. He was patronized as warmly by Philip II. as by his father Charles V.

Of Titian's private life but little is known. Titian excelled as much in landscape as in figure painting, was equally great in sacred and profane subjects, in ideal heads and in portraits, in frescoes and in oils; and though others may have surpassed him in single points, none equalled

THE ARMING OF LOVE, BY TITIAN.

him in general mastery. As a colorist he is almost unrivalled, and his pictures often reach the perfection of sensuous beauty. He died of the plague in 1576 aged 99, having painted to the last with almost undiminished powers.

**Titicaca,** a remarkable lake, in the heart of the Andes; partly in Peru and partly in Bolivia; 12,545 feet above the sea-level. It lies N. W. and S. E., and is 120 miles in length, with an average width of from 50 to 60 miles. The S. portion, measuring 24 by 21 miles, is almost severed from the main body of the lake by a projecting peninsula. The lake discharges at its S. W. extremity by the Desaguadero into the salt Lake Aullagas, which has no known outlet. The E. shore of Lake Titicaca is abrupt and mountainous, but the W. and S. W. shores are low and level, and are skirted by thick beds of tall rushes swarming with waterfowl, and of floating weed, which affords food to cattle when the scanty land pastures are exhausted. The lake is deep and stormy, so that ice forms near the shores only. It contains a number of strange fishes, and eight species of marine crustaceans, which seem to indicate that it was once at the sea-level. There are eight habitable islands, the largest being Titicaca, which gave its name to the lake, and has an area of 20 square miles. It was the sacred island of the Incas, who laid it out in terraces planted with consecrated maize and flowers, and irrigated by channels supplied from the royal bath at the top. According to Squier, the name Titicaca probably signifies "Tiger Rock," and is due to a fancied resemblance of the rugged crest of the island to a wild cat. The lake is now navigated by steamers, and may be reached by railway from the seaport of Mollendo, 346 miles distant.

**Titiens,** or **Tietjens, Teresa,** a German operatic singer; born in Hamburg, Germany July 18, 1831. She appeared as Lucrezia in her native town in her 16th year, and her subsequent engagements at Frankfurt and Vienna had established her position as the chief lyric artist in Germany before her début in London, on April 13, 1858, as Valentine in "The Huguenots." Her success here was so decided that she made that country her future home, and it was the peculiar scene of her triumphs. She followed Mr. Mapleson's fortunes at the Opera House in the Haymarket and at Drury Lane, and was the chief attraction of his management. Nature not only gifted her with a voice of marvelous strength and brilliant quality, but with a dramatic force illumined by the fire of genius. Her physique was imposing, and her style full of stately dignity. Her rare devotion to her art generated the perfection of her vocal method. On her alone fell the mantle of Grisi, and her repertoire embraced all the grandest tragic rôles in modern opera. As Norma, Donna Anna, Semiramide, Medea, and Leonora, she was unequalled by any of her contemporaries. In the concert room and in oratorio her success was unequivocal. She died in the full maturity of her powers on Oct. 3, 1877, leaving a blank on the stage well nigh impossible to fill, while many friends, particularly among the poor and struggling class, mourned the loss of one beloved for her generosity, unselfishness, and warmth of heart. A monument was erected to her memory in All-Soul's Cemetery, Kensal Green, London in November, 1878.

**Titlark.** See PIPIT.

**Title,** an appellation; a name. Also, an appellation of dignity, distinction, or preeminence given to persons; as, titles of honor, which are words or phrases belonging to certain persons as their right in consequence of certain dignities being inherent in them or conferred on them; as, emperor, king, czar, prince, etc. In the United States there are no titles of distinction save those of professional men, which are conferred by authorized institutions as rewards for distinguished merit. Titles of nobility, conferred by any foreign power on any officer or employé of the United States government, are prohibited by the Constitution, and any foreigner who may hold a title of nobility must, on becoming a citizen of the United States, re-

nounce formally all pretensions to such distinction. Various offices of dignity and trust carry with them certain forms of address, but these forms of address pertain to the offices alone, and the holders of these offices have no claims to the prescribed form of address after their terms of service have expired. The President, governors of States, and ministers of foreign nations are addressed, and spoken of, as your or his "Excellency," save in the case of speaking to the President, who should be addressed as "Mr. President." The Vice-President, members of the Cabinet and members of Congress, heads of departments, assistant secretaries, comptrollers and auditors of Treasury, clerks of the Senate and House of Representatives, State Senators, law judges, mayors of cities, etc., are entitled "Honorable" and formally addressed as "Your Honor." Military, naval, ecclesiastical and other professional dignities are distinguished by the titles common to the English-speaking peoples of the world.

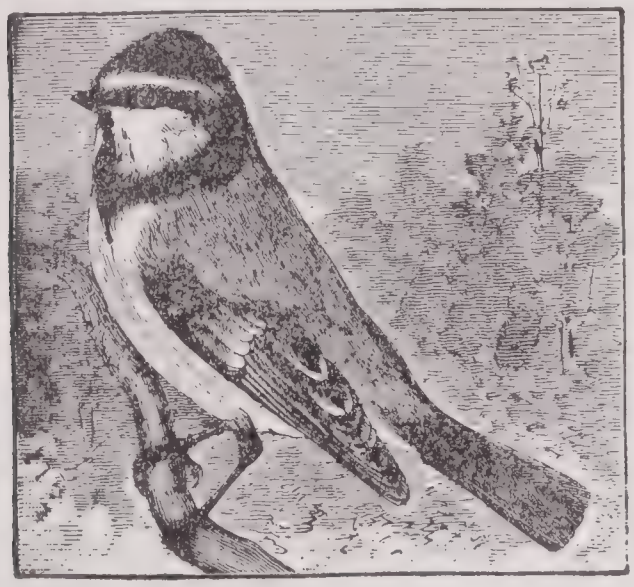
The five orders of nobility in England are distinguished by the titles of duke, marquis, earl, viscount, and baron. The dignity of baronet is distinguished by that word placed after the name and surname of the holder of the dignity, and also by the title of Sir prefixed to the name. This title, like that of the peers, is hereditary. The dignity of knighthood, which is not hereditary, is distinguished by the title of Sir prefixed to the name and surname of the holder. Ecclesiastical dignities carry with them the right to certain titles of honor, besides the phrases by which the dignities themselves are designated: thus, an archbishop is styled His Grace the Lord Archbishop of ——; a bishop, The Right Reverend the Lord Bishop of ——. All persons admitted to the clerical order are entitled to the title of Reverend. Members of the Privy Council are entitled to be styled Right Honorable. Certain municipal offices have also titles attached to them; as, The Right Honorable the Lord Mayor of London, The Right Honorable the Lord Provost of Edinburgh, etc.; certain legal offices also carry with them the right to certain titles, and the children of peers are also entitled by courtesy to certain terms of distinction. Also a claim, a right. "Make claim and title to the crown of France."—Shakespeare, "Henry V." i: 2. Also the inscription in the beginning of a book, containing the subject of the work, and usually the names of the author and publisher, date, etc.; a title page. Or a particular section or division of a subject, as of a law, a book, or the like; especially a section or chapter of a law book.

Ecclesiology and Church history: (1) A condition precedent to, or a claim in favor of, ordination, such as a sphere of parochial or other spiritual work, always required by a bishop, except in certain specified cases, which are specified in Canon 33 of the Anglican Church. In the Roman Church the title formerly required from every ordinand was that of a benefice (*titulus beneficii*), *i. e.*, he was bound to show that he had been nominated to a benefice whose revenues were sufficient for his decent maintenance. The Council of Trent (1545–1563) added two other titles (1) of patrimony (*titulus patrimonii*), where the ordinand had sufficient private property to maintain him respectably, and (2) of pension (*titulus pensionis*), where some solvent person or persons bound themselves to provide for the cleric about to be ordained. The vow of evangelical poverty (*titulus paupertatis*) in a religious order is a valid title; and the students of Propaganda and certain other colleges, and candidates for holy orders in missionary countries, have a title from the mission from which they are ordained or the seminary in which they were educated (*titulus missionis vel seminarii*). The acceptance of this last title imposes on the bishop the responsibility of providing for the support of the ordained, should he become incapable of discharging his functions. (2) A titular church, or the district or parish assigned to it among English and Roman Catholic Churches.

In law: (1) Property or right of ownership, or the sources of such right, or the facts and events which are the means whereby property is acquired; a party's right to the enjoyment of land or goods, or the means whereby such right has accrued, and by which it is evidenced. (2) The instrument or instruments which are evidence of a right. (3) A heading or indorsement; as, the title of an Act of Congress.

**Titmouse** (plural, **Titmice**), in ornithology, a popular name for any individual of the sub-family *Parinæ*. They are remarkable for the boldly defined color of their plumage and their quick, irregular movements, running rapidly along branches in quest of insects, and often clinging thereto with their back downward. They feed not only on insects, but on grain and seeds, and not infrequently kill young and sickly birds with strokes of their stout, strong bill. They are very pugnacious, and the hens show great courage in defense of their nests. The young are fed chiefly on caterpillars, and a pair of blue tits have been observed to carry a caterpillar to their nest, on an average, every two minutes, during the greater part of the day, so that these birds must be extremely serviceable in preventing the increase of noxious insects. The chickadee, so named from its note, is the black-cap titmouse (*Parus atricapillus*) of North America. Seven species are well known in Europe; but one, the crested titmouse

(*Parus cristatus*), is only an accidental visitor. The great titmouse (*P. major*) is about six inches long; head and throat black, cheeks white, back, breast, and sides



BLUE TITMOUSE.

yellowish, wings and tail grayish. The blue titmouse (*P. cæruleus*), which is so called from the bluish tinge in its plumage, and the coal titmouse (*P. ater*), named from its black head and neck, are the commonest British species; the others are the long tailed titmouse (*Acredula caudata, Parus caudatus*), the marsh titmouse (*P. palustris*), and the bearded titmouse (*Panurus biarmicus*), or reedling.

ARCH OF TITUS IN ROME.

**Titration,** in chemistry, the process of estimating the amount of an element or compound contained in a solution, by the addition to it of a known quantity of another chemical capable of reacting on it. The end of the process is determined by the complete precipitation of the compound, or by the discharge and production of some definite color in the mixed solutions. See ANALYSIS.

**Titular Bishop,** a title substituted by Pope Leo XIII. for the older one of bishop *in partibus infidelium*.

**Titular Church,** a name given to the parish churches of Rome, as distinct from the patriarchal churches, which belonged to the Pope, and from the oratories. Each titular church was under a cardinal priest, had a district assigned to it, and a font for baptism in case of necessity.

**Tittmann, Friedrich Wilhelm** (tit'-män), a German historian; born in Wittenberg in 1784. His "Study on the Amphictyonic League" (1812) was crowned by the Berlin Academy. His principal work is a "History of Henry the Illustrious" (2 vols. 1845–1846). Among his other writings are: "A View of the Civilization of our Times" (1835); "On Life and Matter" (1855); "Aphorisms of Philosophy" (1859); "Nationality and the State" (1861). He died in 1864.

**Titus,** the Roman prænomen but the usual name for the 11th of the 12 Cæsars, Titus Flavius Sabinus Vespasianus, the eldest son of Vespasian and Flavia Domitilla; born in Rome, Dec. 30, A. D. 40. He was brought up at the court of Nero along with Britannicus, and early served with credit as tribune in Germany and Britain, and in Judæa under his father. On Vespasian's elevation to the throne Titus was left to prosecute the Jewish war, which he brought to a close by the capture of Jerusalem after a long siege (70). Both father and son enjoyed a joint triumph in 71. About this time Titus received the title of Cæsar, and took a share in the work of government. He gave himself up to pleasure, and his attachment to Berenice, the

daughter of Herod Agrippa I., grievously offended the Romans. But no sooner had Titus assumed the weight of undivided power (79) than his whole character became changed. The very first act of his reign was to put a stop to all prosecutions for *læsa majestas*, and to decree heavy punishments against informers. He assumed the office of Pontifex Maximus in order to keep his hands free from blood. He completed the Colosseum and built the baths which bear his name, and lavished his beneficence on the sufferers from the great eruptions of Vesuvius, which overwhelmed Herculaneum and Pompeii (79), and the great three days' fire at Rome, followed by pestilence the year after. Titus was now the idol of his subjects, the "love and delight of mankind." He loved to give, and the characteristic story is told that one night he exclaimed "I have lost a day" when he remembered he had given nothing away that day. But unhappily he died suddenly at his patrimonial villa in the Sabine country, Sept. 13, 81, not without the suspicion that he had been poisoned by his younger brother Domitian.

**Titus,** a companion of St. Paul, though not mentioned in the Acts of the Apostles. He seems to have been converted by the apostle (Tit. i: 4), probably at Antioch A. D. 50 or 51, and in the same year accompanied him to Jerusalem, and was present at that first council which recognized Gentile converts as part of the Church, and exempted them from the burden of the Mosaic ritual (cf. Acts xv. 1–35 with Gal. ii: 1–3). Paul soon afterward practically carried out the liberty thus accorded by refusing to require Titus, who by birth was a Greek, to be circumcised (Gal. ii: 3–5). Titus was subsequently with Paul at Ephesus (A. D. 56), whence the former was sent on a special mission to the Corinthians, perhaps carrying with him Paul's second epistle to that Church (II Cor. viii: 6, 22, 23, xii: 18). When Titus returned (A. D. 57) he found the apostle in Macedonia (II Cor. vii: 5–6, 13–15). Subsequently (probably A. D. 65 or 66) he was left in Crete to arrange the affairs of the Church and "ordain elders in every city" (Tit. i: 5). Returning thence to Rome he was dispatched by Paul (A. D. 66 or 67) to Dalmatia (II Tim. iv: 10). According to tradition Titus returned to his work in Crete, and died a natural death at an advanced age.

The Epistle of Paul to Titus, the third of St. Paul's pastoral epistles. It was written to give Titus directions respecting the organization of the Cretan Church. After an introduction (i: 1–5), the apostle lays down the qualifications of a scriptural bishop (6–9), gives a warning against Judaizers and other false teachers (i: 10–16), affords directions as to the special duties of aged men and women, young men and women, servants (slaves) (ii: 1–15), and subjects (iii: 1), and social duties (iii: 2), the whole interspersed with evangelical doctrine and precept (ii: 7–8, 11–15; iii. 3–9). He concluded by instructing Titus how to deal with heretics, and asking him to come to Nicopolis (in Epirus?), where he (Paul) hopes to winter, and sends salutations (10–15). There is a considerable resemblance between some passages in Titus and others in the Epistles to Timothy. The external evidence in favor of the epistle to Titus is somewhat stronger than for those to Timothy. The three together are called the pastoral epistles.

**Titusville,** a city in Crawford co., Pa.; on Oil creek and the Dunkirk, Allegheny Valley, and Pittsburg, the Western New York and Pennsylvania railroads; 18 miles N. of Oil City. Here are a public library, high school, waterworks, electric lights, churches, National and State banks, and several daily and weekly newspapers. The first petroleum well in the United States was opened in the suburbs of the city in 1859, and since then the principal industry has been the production of oil. The city also has manufactories of soap, silk goods, radiators, chairs and furniture, engines, boilers, steel and iron forgings, oil-well drilling tools, etc., and an assessed property valuation of nearly $3,000,000. Pop. (1900) 8,073; (1910) 8,533.

**Tiumen,** a town of Western Siberia; at the confluence of the Tjumenka with the Tura, a tributary of the Tobol; 138 miles S. W. of Tobolsk. It is regularly built (chiefly of wood), has 10 stone churches, a mosque, etc. There are manufactures of soap, tallow candles, and textile fabrics, bell and iron foundries, potteries, and shoemaking. Tiumen is also a great center of transit traffic — boats coming here from the Obi, Irtish, Tobol, and Tura, and unshipping goods for the W. and S. A great market is held here in January. Pop. (1897) 29,588.

**Tiverton,** a town of N. Devon, England; 18 miles N. of Exeter; on the slope of a hill above the confluence of the Exe and Loman, from whose two fords it derives its Old English name of Twy-ford-ton. The chief of its three churches, St. Peter's (136 feet long by 82 feet wide, with a tower 110 feet high), dates from 1073, but was partly rebuilt in the 16th, and was thoroughly restored in the 19th century. Other edifices are the town hall (1864), in late Venetian style, with a tower of 80 feet, a market house (1830), and the grammar school ("free" in name but not in fact), which, founded by Peter Blundel in 1604, and familiar to every reader of Blackmore's "Lorna Doone," has given place to a modern structure. The historic building, how-

ever, will remain intact. The cloth trade has declined since the 17th century, and lace making is now the leading industry. Pop. (1901) 10,382.

**Tivoli,** an old Roman town in Italy, in the province of Rome; beautifully situated on the left bank of the Teverone; 17 miles E. N. E. of Rome. It is interesting from the number of antiquities it contains, the most remarkable of which are the remains of the temples of Vesta and the Sibyl, and the villas of Mæcenas and Hadrian. Near the town is the Villa d'Este, erected in 1549. In 1826 a serious inundation destroyed many houses, and in consequence a new channel was formed for a part of the waters of the river, by the construction of two shafts through the limestone rock of Monte Catillo, 870 feet and 990 feet long respectively. In 1834 this new channel was opened by Folchi in the presence of Pope Gregory XVI., and a new waterfall was thus formed 330 feet high. Pop. (1901) 13,396.

**Tlaxcala** (tläs-kä'lä), the smallest State of Mexico; on the plateau of Anahuac; nearly surrounded by Puebla, and touching Mexico State on the W.; area 1,595 square miles; pop. (1900) 172,315. In Aztec days Tlaxcala was the seat of an independent republic, which survived for a time under the protection of the Spaniards. The capital Tlaxcala, stands 7,300 feet above the sea, and has some manufactures of woolens.

**Tlemcen,** a town in the province of Oran, Algeria; 88 miles S. W. of Oran, with which it is connected by railway. It occupies the site of the Roman city of Pomaria, and under the Moors, in the 12th and 13th centuries, was a place of great importance, with a pop. of nearly 150,000. It stands on the N. slope of a steep mountain, at a height of 2,500 feet, in the midst of a well-irrigated and richly cultivated country, which especially abounds in fruit trees. The chief exports are olive oil, dried fruit, corn, wool, sheep and cattle, dressed alfa cloths, carpets, and leather goods. It has 23 mosques, two of which are fine specimens of Moorish architecture. Pop. (1901) 22,273; commune, 35,468.

TREE TOADS.

**Toad,** in zoölogy, the popular name of any species of the family *Bufonidæ,* which is almost universally distributed, but is rare in the Australian region, one species being found in Celebes and one in Australia. Three species are European; the common toad (*B. vulgaris*) and the natterjack (*B. calamita*), and *B. variabilis.* The common American species is *B. lentiginosus,* and is more active than the European species, moving principally by leaping. The first is the type of the family. The body is swollen and heavy-looking, covered with a warty skin, head large, flat, and toothless,

with a rounded, blunt muzzle. There is a swelling above the eyes covered with pores, and the parotids are large, thick, and prominent, and secrete an acrid fluid, which probably gave rise to the popular stories about the venom of the toad, or they may owe their origin to the fact that when handled or irritated these animals can eject a watery fluid from the vent. But neither the secretion from the parotids nor the ejected fluid is harmful to man, and there is little doubt but that its effects on the lower animals have been much exaggerated. The toad has four fingers and five partially webbed toes. The general color above is a brownish-gray, the tubercules more or less brown; under surface yellowish white, sometimes spotted with black. Toads are

POUCH TOAD.

terrestrial, hiding in damp, dark places during the day, and crawling with the head near the ground, for their short limbs are badly adapted for leaping. They are extremely tenacious of life, and can exist a long time without food; their hibernation in mud, cracks, and holes has probably given rise to the stories of their being found in places where they must have existed for centuries without food and air. These stories, however, have no foundation in fact, for Dr. Buckland proved, by direct experiment, that no toad can live for two years if deprived of food and air.

**Toadfish,** a popular American name for any fish of the genus *Batrachus*, from the large head, wide gape, and generally repulsive appearance of the species. The common toadfish (*B. tau*) is from eight inches to a foot long, light brown marbled with black. The grunting toadfish (*B. grunniens*), about the same size, is brownish above, with darker markings, white below, fins white with brown bands. There are about 12 species from tropical and subtropical seas.

**Toadflax,** the English name of various plants of the genus *Linaria*, order *Scrophulariaceæ*. The common toadflax is *L. vulgaris*, which in its general habits is not unlike flax. The flowers are of a bright yellow; the corolla labiate, resembling that of snapdragon in shape, but provided with a long spur. It grows in hedges and fields, and is a reputed purgative and diuretic. The ivy-leaved toadflax (*L. Cymbalaria*) is often found trailing over old walls. Allied to this genus is the ANTIRRHINUM (*q. v.*).

**Toadstone,** a popular name for BUFONITE (*q. v.*), from the fact that it was formerly supposed to be a natural concretion found in the head of the common toad. Extraordinary virtues were attributed to it; it was held to be a protection against poison, and was often set in rings. That this belief was rife in Shakespeare's time is proved by the lines ("As You Like It," ii: 1):

> "Sweet are the uses of adversity,
> Which, like the toad, ugly and venomous,
> Wears yet a precious jewel in his head."

According to Sir Thomas Browne there were two kinds of toadstones known in his day; the one "a mineral concretion, not to be found in animals, but in fields"; the other "taken not out of the toad's head, but out of a fish's mouth, being handsomely contrived out of the teeth of the *lupus marinus*, a fish often taken in our N. seas, as was publicly declared by an eminent and learned physician."

**Toadstone,** an igneous rock of Carboniferous age, occurring in veins and sheets in limestone. The German name was given because of its barrenness in metalliferous ores. The rock is usually much altered by chemical agencies, but it evidently belongs to the group of dolerites.

**Toad's Eye Tin,** a variety of Cassiterite occurring in aggregated groups of exceedingly small round bodies with radiate structure, supposed by the Cornish miners to resemble the eye of a toad.

**Toadstool,** in botany, an uneatable agaricus, boletus, or other fungus of conspicuous size, as distinguished from a mushroom or eatable agaric.

**Toaspern, Otto,** an American artist; born in Brooklyn, N. Y., March 26, 1863; was graduated at the Royal Academy of Fine Arts, Munich, in 1888; studied with Gysis and Nauen; and became an instructor in the National Academy of Design, New York city. He is best known as an illustrator of "Life," "Ladies' Home Journal," "Century," "Harper's," and leading European periodicals.

**Tobacco,** a very important plant, belonging to the natural order *Atropaceæ*, or night-shade order. The introduction of the use of tobacco forms a singular chapter in

Tobacco

the history of mankind. According to some authorities smoking was practised by the Chinese at a very early date. At the time of the discovery of America, tobacco was in frequent use among the Indians, and the practice of smoking, which had with them a religious character, was common to almost all the tribes (see CALUMET). The name tobacco was either derived from the term used in Haiti to designate the pipe, or from Tabaca in Santo Domingo, whence it was introduced into Spain and Portugal in 1559 by a Spaniard. It soon found its way to Paris and Rome, and was first used in the shape of snuff. Smoking is generally supposed to have been introduced into England by Sir Walter Raleigh, but Camden says the practice was introduced by Drake

THE TOBACCO PLANT.

and his companions on their return from Virginia in 1585. It was strongly opposed by both priests and rulers. Pope Urban VIII. and Innocent IX. issued bulls excommunicating such as used snuff in church, and in Turkey smoking was made a capital offense. In the canton of Bern the prohibition of the use of tobacco was put among the 10 commandments immediately after that forbidding adultery. The "Counterblast" or denunciation written by James I. of England is a matter of history. All prohibitions, however, regal or priestly, were of no avail, and tobacco is now the most extensively used luxury on the face of the earth.

The most commonly cultivated tobacco plant (*Nicotiana tabacum*) is glutinous, and covered with a very short down; the stem upright, four or five feet high, and branching; the leaves are lanceolate, from 6 to 18 inches long; the flowers are terminal and rose-colored. A less esteemed species is *N. rustica*, distinguished by a short yellowish-green corolla. The best Havana cigars are made from the leaves of *N. repanda*. All the tobacco plants are natives of America, and that continent has continued the principal producer, the chief tobacco-growing country being the United States, and the chief localities being Virginia and Kentucky. It was first cultivated in Holland early in the 17th century, and soon extended to other countries, including Austria, Germany, Russia, the Balkan Peninsula, Asiatic Turkey, France, British India, Cuba, Brazil, the Philippine Islands, Japan, and Australia. The cultivation in Great Britain was forbidden from an early date till 1866, when it was permitted under certain conditions.

Tobacco owes its principal properties to the presence of a most poisonous alkaloid named NICOTINE (*q. v.*). In the cultivation of tobacco the object is to render the leaves as large and as numerous as possible. When the leaves become brittle the plants are cut close to the ground, and afterward carried to the drying shed, where they are hung up in lines to sweat and dry. When perfectly dry the leaves are stripped from the stalks and made into small bundles, which are subsequently stowed in casks for exportation. In the manufacture of tobacco the leaves are first thoroughly cleansed with salt and water. The midrib of the leaf is then removed; the leaves are again sorted, and the large ones set apart for making cigars. The leaves may either be cut finely for use in pipes, as is the case with "shag" tobacco, or they are moistened and pressed into cakes, which are designated cavendish; or they are pressed into sticks, as negrohead; or again the leaves may be spun in the form of a rope of greater or less thickness; the smallest twist is called pigtail. The midribs, separated in the first process of manufacture, are preserved to be converted into SNUFF (*q. v.*) Cigars, cigarettes, and cheroots are favorite forms of manufactured tobacco. As the best leaf is grown in Cuba, so also are the best cigars made there. The leaf used for the manufacture of Manila cheroots is grown chiefly on the island of Luzon. During the fiscal year ending June 30, 1901, the exports from the United States of manufactured tobacco aggregated 315,787,782 pounds, chiefly leaf, valued at $27,656,475; and the exports of manufactured tobacco, chiefly cigars, cigarettes, and plug tobacco, had an aggregate value of $5,092,603. During the same period the collections of internal revenue on manufactured tobacco amounted to $62,481,907.

Tobacco Industry

**Tobacco Industry.** A new impetus has been given in recent years to the tobacco industry in the United States — ever one of the lines of enterprise most largely contributory to the material prosperity of the country. There can be no doubt but that these new conditions have been induced in part by the very extensive investigations relative to this plant which have been carried on during the past three years by the Division of Soils of the Department of Agriculture. A systematic study has been made of all the diseases of the crop, and the very important discovery has been made that the ever troublesome fermentation is not caused by bacteria, as had always been supposed, but by chemical ferments produced by the tobacco plant itself. This discovery has suggested important modifications of the old methods of handling tobacco which promise much improvement in leaf tobacco, and will unquestionably be the means of adding millions of dollars to the wealth of the country. Tobacco was grown in this country long before the arrival of the first settlers, and served as legal tender during the early days of the colonies. However, the beginning of the last century found only the dark export types of Virginia and the light pipe-smoking tobacco of Maryland grown to any extent, and it has been within the century which has just closed that the cigar, lemon-yellow cigarette, mahogany manufacturing, Burley and Perique classes have been developed.

Even during the earlier years of the century wherein the tobacco industry made such advancement, the rate of progress was slow. It was only when foreign consumers made an imperative demand for colored tobaccos that the utilization of artificial heat for curing was introduced. During the first quarter of the century wood fires were the only artificial means employed for curing tobacco. Then flues and charcoal fires were introduced; but it was not until after the Civil War that flue curing entirely superseded charcoal fires in the production of the bright yellow varieties now used for cigarette, plug and twist wrappers.

The States of Virginia and Maryland constituted the original seat of the tobacco industry. New England settlers attempted to cultivate it; but the first real extension of the industry was W. into Kentucky and Tennessee. The first crop of lemon-yellow tobacco was produced in 1852 on a sandy ridge in Caswell Co., North Carolina, and the variety attained such popularity that its cultivation spread rapidly until the outbreak of the Civil War, which conflict of course interrupted the culture for half a decade. In 1864 the white Burley tobacco was originated, and by reason of the absorbent powers of the leaf proved particularly well adapted for wrappers.

All the principal nations of the world purchase considerable quantities of tobacco from the United States. It is significant that each country differs in its requirements and in the character of the leaf used. Inasmuch as all the various countries are supplied from the same section of the country, and the differences in the tobaccos would appear to a casual observer to be very slight, considerable experience is required on the part of a packer to assort the various tobaccos into the grades suitable for each country, and to put the weed in the condition required by the particular country to which it is to be consigned.

These differences are, however, real and not imaginary as some persons might be inclined to suppose. For instance, Great Britain, which requires the best leaf and pays the highest price, demands a large leaf, olive green in color and so heavily smoked in curing that the odor of wood is apparent in the leaf. Africa, on the other hand, takes a long narrow leaf of heavy body, which is made very black by steaming and packing under heavy pressure in the hogshead while the tobacco is still warm. Oil is applied by means of a sponge to each layer as it is packed.

The curing of all the dark export tobaccos is effected by open hardwood fires. The Virginia tobacco is, generally speaking, somewhat superior to the yield from Kentucky and Tennessee, and consequently most of it is retained by the manufacturers in this country. The tobacco farmer usually assorts his harvest into "lugs," "good leaves," and "top leaves," but the final grading and treatment are left to the determination of the packer, who decides into which country each quality of tobacco shall be sent. The light tobaccos used exclusively for pipe-smoking and cigarettes are produced principally in Maryland and Ohio. That grown in the former State is air-cured, while the Ohio product is cured by means of wood fires.

The agents of foreign countries who buy so many million dollars' worth of tobacco in this country purchase entirely by sample. The tobacco goes from the plantation to a large warehouse established for the inspection of the goods by State officers. When the tobaccos have been entered in the warehouse, a sworn and bonded inspector draws four samples from each hogshead, taken from different places and at equal distances apart, beginning near the bottom of the hogshead. These samples are tied together and after being sealed are labeled with the name of the owner, the number of the hogshead, the net and gross weight. When a hogshead is forwarded to a foreign purchaser the sample accompanies it, and if there be more than 10 per cent. of the tobacco in the hogshead poorer than the sample, the inspector, who is under bond, becomes liable for the difference.

Tobacco Industry

Tobacco ordinarily grows from 3 to 14 feet in height, according to climate and other conditions. The first step in its culture is the preparation of the seed bed, which in the South is done in January. Before the seeds are sown the ground is burned over in order to kill all foreign seeds and also produce an ash that acts as a fertilizer. The young plants when they attain a prescribed growth are transplanted to hills in the field, where, after they have ripened, the entire plant is cut close to the ground.

The leaves go from the field direct to the curing house, where they are placed upon frames. Perhaps half a ton of tobacco is cured simultaneously, the process occupying some four or five days, and during this interval the leaves are kept at a temperature which is seldom below 100 degrees and for hours at a time is nearly 200 degrees. Then comes the packing according to the market for which the product is destined, as has already been mentioned.

The Census Bureau report on manufactures of tobacco for 1900 shows a capital of $124,089,871 invested in the industry. The value of the products is returned at $283,076,546, to produce which involved an outlay of $8,951,543 for salaries of officials, clerks, etc.; $49,852,484 for wages; $79,495,422 for miscellaneous expenses, and $107,182,656 for material used. The value of cigars and cigarettes was 56.6 per cent. of the total value of all tobacco manufactures; chewing and smoking tobacco and snuff, 36.7 per cent.; and tobacco, stemmed and rehandled, 6.7 per cent. The total production in the United States for 1900 was 868,163,275 pounds, an increase of 379,906,629 pounds, or 77.8 per cent. over the crop of 1890. All the States and Territories were represented except Colorado, District of Columbia, Nevada, Rhode Island and Utah, but the cultivation of tobacco on a large scale was confined to comparatively few States.

The crop of only 18 States exceeded 1,000,000 pounds each, and that of 13 States, 5,000,000 pounds each. Eight States produced more than 20,000,000, and three States more than 100,000,000 pounds each. Kentucky, North Carolina, Virginia, Ohio and Tennessee, in the order named, were the five greatest producers, whose combined crop was 679,791,000 pounds or 78.3 per cent. of the entire production. Kentucky alone produced 36.2 per cent. of the entire crop of the United States.

The genesis of American tobacco culture was in Virginia, and that State exceeded any other in quantity grown till 1870, when Kentucky took first place. Among the leading producers, North Carolina showed the greatest percentage of increase for the decade between the 11th and 12th censuses, and in 1900 ranked second in quantity grown, Virginia being third. The 868,163,275 pounds shown as the total production in the United States was valued at $56,993,003, or an average of 6.6 cents a pound. This was grown from 1,101,483 acres of land, distributed among 308,317 farms, the average crop being 788.2 pounds per acre. It is estimated that the United States grows approximately one-half of the world's supply of tobacco. During the fiscal year ending June 30, 1900, the United States exported 344,655,697 pounds of unmanufactured tobacco.

New York, Pennsylvania, Ohio, Florida and Illinois, in the order named, were the five leading States in value of cigar and cigarette products in 1900. No cigarettes, however, were made in Ohio, and the value of products shown by the table for that State represents cigars exclusively. Only limited quantities of cigarettes were manufactured in Pennsylvania, Florida and Illinois, but New York produced more than any other State. The combined cigar and cigarette manufactures of the five greatest producing States enumerated above were valued at $111,384,213, or 69.5 per cent. of the total of the United States.

The combined production of cigars and cigarettes for the year ending Dec. 31, 1900, approximated 9,500,000. More than 118,000,000 pounds of tobacco were used in their manufacture, the average being 12.6 pounds of tobacco to each 1,000 cigars and cigarettes.

In cigars alone, an average of 17.1 pounds of tobacco were used to each 1,000 and in cigarettes an average of four pounds. Pennsylvania was the leading State in the separate manufacture of cigars with a production of 1,624,527,885; New York, Ohio, Maryland and Illinois followed in the order named, with 1,291,273,550; 658,819,883; 403,548,626, and 281,400,268, respectively. The combined product of these five States was 4,259,570,212, or 69 per cent. of the entire output in the United States.

The 10 leading cities in cigar manufacture in the order of their production were: New York, Cincinnati, Philadelphia, Pittsburg, Richmond, Va., Chicago, Baltimore, Lancaster, Penn., Tampa, Fla., and Detroit. The output of the extremes, New York and Detroit, approximated 760,000,000 and 100,000,000 cigars respectively.

The geographical distribution of cigarette manufacture is much more limited than the manufacture of cigars. Only 19 States are represented and the output of a majority of these was comparatively small. New York led, with an output of 1,746,454,120, followed by Virginia, North Carolina, Louisiana and California, in the order named, with 742,933,030; 649,314,810; 48,249,800, and 31,522,880 cigarettes, respectively. The combined produc-

tion of these five States was 3,218,474,-540.

In 1905 the census reported 16,395 establishments engaged in the manufacture of cigars and cigarettes, having a combined capital of $145,135,945, employing 135,-418 wage-earners, using stock valued at $81,134,561, and having a total output valued at $214,350,051. In the manufacture of smoking and chewing tobacco and snuff there were 433 establishments, employing $178,847,556 capital and 23,900 wage-earners, paying $44,954,047 for stock, and having an output valued at $116,767,630.

**Tobacco Sugar,** a mixture of saccharose, dextrose, and levulose, discovered by Dr. James Bell in tobacco leaves, which have been preserved from any undue fermentative action. The three varieties of sugar exist in such proportions as to have no effect on a ray of polarized light. The sugars, separated as a lime compound, decomposed with oxalic acid, and purified by animal charcoal, yielded results approximating to a cane sugar, dextrose, and levulose. The first-named differs from ordinary cane sugar by refusing to crystallize, and yielding an inverted sugar with an angle of nearly —19°.

**Tobago,** the most S. of the Windward Islands; belonging to Great Britain; 75 miles S. E. of Grenada and 18½ miles N. E. of Trinidad; 32 miles long; from 6 to 7½ miles broad; area 114 square miles; pop. (1901) 18,750. The island was discovered by Columbus in 1498, and named by him Assumption; the name of Tobago is supposed to have arisen from the free use of tobacco by the Caribs when first visited by Europeans. It has been frequently contested between Dutch, Spaniards, and French, but came into British possession in 1763. The island is volcanic, its surface being irregular and picturesque, and abounding in conical hills and spurs, all connected by a ridge running through the interior, the greatest elevation of which is 1,800 feet above the level of the sea. From the high ridge descend deep and narrow ravines, which terminate in small alluvial plains. Scarborough is its chief town, pleasantly situated on the S. side, and at the base of a conical hill rising 425 feet in altitude, crowned by Fort King George, now without garrison. The chief exports are rum, molasses, cocoanuts and livestock to the amount of from $100,000 to $200,000. The imports run from $100,000 to $150,000. The island was united with the colony of Trinidad in 1889, and has a commissioner appointed by the governor.

**Tobit,** in the Apocrypha, a book generally placed between II Esdras and Judith, and containing 14 chapters. A pious man, Tobit by name, resident in Thisbe in Naphthali, was taken captive by Enemessar (Shalmaneser), King of Assyria, and located in Nineveh. When his countrymen were put to death by the king's order, their bodies were thrown into the streets. Tobit made a practice of burying them and compromised himself by these acts of humanity. Once, when he had buried a body, and, being in consequence ceremonially unclean, was sleeping outside by the wall of his courtyard, "the sparrows muted warm dung" into his eyes and made him blind (i., ii.). In the days of his prosperity he had lent 10 talents of silver to a countryman, Gabael, who lived at Rages in Media. At another Median city, Ecbatana, was a relative of his called Raguel, whose daughter Sara had been married to seven husbands, all of whom had been killed by Asmodeus, the evil spirit, on the marriage night before they could possess their bride. To recover the lent money, Tobit dispatched his son Tobias, having as his companion a man-servant. The two set out for Rages, taking Ecbatana on the way. As Tobias was bathing in the Tigris, a fish leaped out of the water, attempting to devour him; but he caught his assailant, which was cooked and devoured by the travelers, the heart, the liver, and gall being kept by Tobias, on the advice of his companion, the heart and liver to be smoked for the expulsion of evil spirits from persons possessed, and the gall to remove whiteness in the eye (iii.–vi.). Arrived at Ecbatana, he married the maiden, smoking out the evil spirit who would have made away with him. During the marriage festivities the companion was dispatched to Rages for the lent money, and obtained it, the two ultimately returning with the bride to Nineveh to Tobit, whose blindness was cured by the gall of the fish (vii.–xi.) When the time came for paying the servant, he declined all compensation, and revealed himself to be Raphael, one of seven angels of exalted rank and function (xii.). Sincere thanksgiving followed to God, who had sent the angel (xiii.). By direction of Tobit, Tobias removed from Nineveh, the destruction of which had been prophesied by Jonah (xiv.; Jonah iii: 4, etc.).

Viewed as a tale designed to commend piety and trust in God, the book of Tobit evinces considerable genius, the plot being well sustained, and some of the scenes, depicting domestic life, being beautifully drawn. It resembles a modern novel in making its virtuous hero struggle with adversity, in having love scenes and a marriage, and a personage apparently of humble rank ultimately proved to be of a very high order, with a general diffusion of happiness at the close. Whether or not there is in it a nucleus of historic truth cannot be known; the most of it is clearly unhistoric. The expulsion of evil spirits by the smoke of the burning heart and liver of a fish, and the curing of eye disease by its

gall, are mentioned apparently not as miracles, but as parts of the ordinary course of nature. A fish large enough to threaten the life of Tobias is eaten by him and the angel seemingly at a single meal. Finally, as shown by Professor Sayce, it was not Shalmaneser, but Tiglath Pileser, who carried the people of Naphthali captive (Tobit i. 2, 3, and II Kings xv: 29); Sennacherib's father was not Shalmaneser, but Sargon (Tobit i: 15); it was not 55 days, but 20 years, after the return of Sennacherib from Palestine that he was murdered by his sons (21). It is doubtful if either Rages or Ecbatana existed at the time when Tobit is said to have lived (i: 14, iii: 7). Those who captured Nineveh were Kyaxares and Nabopolassor, not Nebuchadnezzar and Assuerus (Xerxes), the latter of whom did not live till 150 years after the time when Nineveh fell (xiv: 15). It is believed that Tobit was written about 350 B. C. Opinions differ as to whether or not it was first published in Greek, or whether there may have been a Hebrew or an Aramæan original.

**Tobler, Adolf** (tō'bler), a Swiss philologist of Romance languages; born in Hirzel, Zürich, May 24, 1835. He became professor in the University of Berlin, 1867. He wrote: "French Versification in Ancient and Modern Times" (1880); "Miscellaneous Contributions to French Grammar" (1886).

**Tobogan,** or **Toboggan,** a kind of sled used for sliding down snow-covered slopes. It is simply a piece of birch or basswood, a quarter of an inch thick, from five to eight feet long by one or two broad, bent up in front like the dashboard of a sleigh, and braced by several cross pieces of hard wood a foot apart, and by two round rods, one on each side, on top of the cross pieces, all fastened by catgut to the sleigh. The bend at the bow is strengthened by two cross pieces, and kept in shape by catgut strings at the ends bound to the front cross piece and rod. Grooves are cut on the under side of the tobogan to let the knots sink below the wood. Also a sled to be drawn by dogs over snow.

**Tobol,** a river of Siberia, which rises in the W. slope of the Ural Mountains, in the province of Orenburg, and joins the Irtish at the town of Tobolsk, after a course of about 550 miles.

**Tobolsk,** a town of Western Siberia, capital of a province, at the confluence of the Irtish and the Tobol, nearly 2,000 miles E. of St. Petersburg. It is well built, with timber houses and wide and regular streets, and its position on the two great rivers is picturesque; but its situation, considerably N. of the great commercial highway between Russia and Siberia, and at a distance from the more productive regions of the country is unfavorable for the development of commerce. Pop. (1900) 21,401.

**Tocantins** (-tēnz'), a river of Brazil, which rises in lat. 14° S., flows N., receives the Araguay, and enters the Atlantic by the Pará estuary, forming one mouth of the Amazon. The entire course is 1,590 miles, and is navigable for 1,080; but navigation is much impeded by sandbanks and rapids.

**Tococa,** in botany, a genus of *Melastomaceæ,* the leaf stalks of which have a bladder, divided longitudinally into two parts, which the ants utilize as nests. The flowers are pink or white. The fruit of *T. guianensis* is eatable, and the juice is used in Demerara for ink.

**Tocornalite,** a pale yellow amorphous mineral, altering by exposure to the air to a blackish color. Soft; streak, yellow. Analysis yielded: Silver, 33.80; mercury, 3.90; iodine, 41.77; siliceous residue, 16.65 = 96.12, hence the probable formula, $AgI + Hg_2I$. Occurs at Chañarcillo, Chile.

**Tocqueville, Alexis Charles Henri Maurice Clérel de,** a French politician; born in Verneuil, July 29, 1805. His father was Hervé Louis François Joseph Bonaventure Clerel, Comte de Tocqueville (1772–1856), peer of France, politician and historian, and a writer of some merit. The son studied philology at Metz and at Paris (1823–1826). In 1827 he was appointed *juge auditeur* of the tribunal of Versailles. In 1831–1832 he was sent by the French government, along with his friend M. de Beaumont, to the United States to inspect and report on the American prison system. They published a joint work on their return, entitled "Of the Penitentiary System in the United States and its Application in France" (Par. 1832; 3d ed. 1845). This treatise, which was crowned by the Academy, recommends the solitary confinement of prisoners. In 1832 Tocqueville resigned his office under government, and, after a brief visit to England, gave himself up to the composition of the first of his two great works, "Democracy in America" (1835–1840, 15th ed. 1868). This work is in reality a treatise on the general principles which ought to be taken as the rule of action by

ALEXIS DE TOCQUEVILLE.

all democratic governments. These are, in brief: (1) full extent of individual liberty with all its concomitants (as freedom of the press, etc.); (2) careful avoidance of centralization. The bearings of this on French politics is obvious. This work was received with the favor it deserved; the Academy awarded to it a special prize of 8,000 francs, and a quick succession of honors was bestowed on the author. In 1837 he was appointed chevalier of the Legion of Honor; in 1839 he was chosen by the electors of Valagnes as their representative; and in 1841 he was elected member of the Academy. For some years practical politics occupied all his attention. In 1849 he entered the Odilon Barrot Cabinet as minister of foreign affairs, but the coup d'état of Dec. 2 — to which, as may be imagined, he was strongly opposed — drove him from office. He then occupied himself with "The Old Government and the Revolution" (1856, 7th ed. 1866). This is his greatest work. It was meant to be an exposition of the manner in which the post-revolution France grew out of the pre-revolution France. From a review of the previous state of things it was conclusively proved that the outburst was not, and could not be, caused by any party or sect; on the contrary, it was an absolutely necessary resultant of the preëxisting causes. This work, powerful as it is, was but a fragment of the original design. Tocqueville intended to follow it up by others dealing with the great events in the later history of France. He was engaged at these when he died in Cannes, April 16, 1859. Besides the works mentioned above, he wrote "État Social et Politique de la France" (trans. by J. S. Mill, in "Westminster Review," 1836), "Le Droit au Travail" (1848), and a number of reports and papers on prison reform and general, social, and political subjects. All the works of Tocqueville are written in a calm, dignified, and powerful style. An ardent lover of liberty, he is yet fair to all sides. His facts are unimpeachable, and the conclusions he draws are invariably logical. No more luminous, severe, dispassionate intellect ever applied itself to politics. It is hardly extravagant to call him the greatest political thinker of his day in France, perhaps even in Europe. His "Complete Works" (9 vols. 1860–1865) were edited by his friend M. de Beaumont, who also edited his "Correspondance" (1860), to which he prefixed a biographical memoir.

**Tocsin,** an alarm bell, or the ringing of a bell for the purpose of giving an alarm. The use of the tocsin, during the troubles of the French Revolution, to assemble the multitudes, has rendered the word almost proverbial.

**Toddalia,** in botany, a genus of *Xanthoxylaceæ*. Leaves alternate, trifoliolate, with pellucid dots; flowers small, unisexual, in terminal panicles; fruit a globular berry. Natives of tropical Asia and Africa. *T. aculeata* is a large, scandent prickly shrub from the Indian mountains. The people of Coromandel eat the leaves raw and pickle the ripe berries. Both have a pungent taste. Its bark is used in remittent fever. A tincture or infusion of it is an aromatic tonic. The root bark is used in Madras as a dyestuff.

**Todars, Todawars,** or **Tudas,** the name of a singular race of people found in the upper part of the Neilgherries, in Southern India. They are a fine, muscular race, of

A TODAR.

pastoral habits of life; possess a peculiar, unwritten language of their own; worship the sun; practise polyandry; assert that their ancestors were the aboriginal inhabitants of Hindustan; levy a *goodoo*, or tithe, of one-sixth of the crops of various agricultural tribes, they themselves holding aloof from the culture of the soil.

**Todd, Henry John,** an English author; born in 1763; studied at Hertford College, Oxford, where he graduated (1786), took orders, and became successively vicar of Milton, near Canterbury (1792), rector of All Hallows, Lombard Street, London, and keeper of the MSS. at Lambeth Palace, and rector of Settrington, Yorkshire (1820), where he died, Dec. 24, 1845. Among his voluminous works the most valuable are his elaborately annotated editions of Milton and Spenser, his "Illustrations of the Lives and Writings of Gower and Chaucer," and his expanded edition of Johnson's "Dictionary."

**Todd, John,** an American Congregational clergyman; born in Rutland, Vt., Oct. 9, 1800. His lesson-books and other works for Sunday-schools were used all over America for many years. Among his other publications were: "Hints to Young Men"; "Summer Gleanings"; etc. He invented the "Index Rerum" for the use of students. He died in Pittsfield, Mass., Aug. 24, 1873.

**Todd, James Henthorn,** an Irish scholar; born in Dublin, Ireland, April 23, 1805; was graduated at Trinity College, Dublin, of which he became a fellow in 1831. Entering the Church, he was appointed Professor of Hebrew (1849), and librarian of Dublin University (1852); was twice chosen Donellan lecturer, became treasurer and precentor of St. Patrick's Cathedral (1864), took a leading part in founding the Irish Archæological Society, and for five years was president of the Royal Irish Academy. He died at Rathfarnham, near Dublin, June 28, 1869. His most important works are "St. Patrick, Apostle of Ireland" (1863), and editions of ancient Irish records, as "The Martyrology of Donegal," "The Book of Hymns of the Ancient Church of Ireland" (1855), the Irish version of Nennius (1848) and "The Wars of the Gaedhill with the Gaill."

**Toddy,** the name generally given by Europeans to the sweet, refreshing liquors which are procured in the tropics by wounding the spathes or stems of certain palms, on which the sap and juices exude from the trunks or from the fruit stalks. In the West Indies toddy is obtained from the trunk of the *Attalea cohune*, a native of the Isthmus of Panama. In Southeastern Asia the palms from which it is collected are the gomuti, cocoanut, palmyra, date, and the kittul, or *Caryota urens*. When newly drawn from the tree the liquor is clear and in taste resembles malt. In a very short time it becomes turbid, whitish, and sub-acid, quickly running into the various stages of fermentation, acquiring an intoxicating quality, still retaining the name of toddy. It is also distilled into arrack, made into vinegar, and throughout all eastern countries is employed as yeast, as it begins to ferment in a few hours after it is drawn.

Also a mixture of spirit and water sweetened; as, whisky toddy. Strictly speaking, toddy differs from grog in being always made with boiling water, while grog is made with cold water, but the latter word is often used in the same sense as toddy.

**Toddy Cat,** the *Paradoxurus typus*, common throughout the greater part of India and Ceylon, extending through Burma and the Malayan peninsula to the islands. It is about 45 inches long, of which the tail occupies about 20; color brownish-black, with some dingy yellowish stripes on each side.

**Toddy Shrike,** or **Toddy Bird,** the *Artamus fuscus*, the Palmyra swallow, or ashy swallow shrike, from India and Ceylon. It is about seven inches long, of dusky plumage, and is most abundant in wooded districts, especially where palm trees abound, more particularly the Palmyra palm, from which it takes several of its popular names.

**Todhunter, Isaac,** an English mathematician; born in Rye, Sussex, England, in 1820; studied at University College, London, and afterward graduated at St. John's College, Cambridge, where he resided as fellow, tutor, and principal mathematical lecturer. He wrote a series of popular textbooks on mathematics, a "History of the Mathematical Theories of Attraction and the Figure of the Earth" (2 vols. 1873); etc. He died in Cambridge, in 1884.

**Todirhamphus,** a genus of *Alcedinidæ*, with three species, confined to the Eastern Pacific Islands. Bill straight, very much depressed; nostrils basal, fissure oblique, hardly apparent, bordered by the frontal feathers; wings short, rounded; tail long, feathers equal, and 12 in number; tarsi elongated, moderate, and reticulated.

**Todleben, Franz Edward,** a Russian military engineer; son of one of the Kaufmanns; born in Mitau, Kurland, May 8, 1818; educated at Riga, and at the College of Engineers in St. Petersburg. He served in the Caucasus against Schamyl, 1848–1851, and under General Schilders in the Danubian campaign of 1853–1854, and on the outbreak of the Crimean War was ordered to the defense of Sebastapol against the Allies. By cumulating the fire of the garrison on the works of the Allies, and pushing forward with prodigious energy the construction of the fortifications of defense, Todleben rapidly turned the tables on his enemy, and asserted an engineering superiority over the attack. His skill, perseverance, and activity seemed to conjure up, as if by magic, the massive ramparts which prolonged the siege for 349 days. Todleben was raised to the rank of general of engineers, and received the order of St. George in 1858. The "Journal of the Defense" was subsequently expanded into the "Defense of Sevastapol" (1863–1870). In this work, which appeared simultaneously in Russian, French, and German, the technical account of the engineering work is supplemented by a full account of infantry and artillery operations. One of its conclusions is that, in spite of the opinion of many military authorities to the effect that "it is useless in time of peace to expend immense sums on permanent fortifications: . . . the defense of Sebastapol has proved directly the reverse." Todleben was intrusted with the defense of Nicolaiev and Cronstadt, and as "adjoint" to the inspector-general of engineering (the Grand-Duke Nicholas), he exercised *de facto* the functions of that office from 1860. In September, 1877, after the failure of the great attack on Plevna, he was summoned to the direction, and completely changing the Russian tactics, completed the investment by the construction of works on the W. side, and so, by intercepting all reinforcements and supplies, ulti-

mately starved Osman Pasha into surrender on Dec. 11, with 20,000 men and 60 guns. On March 28, 1878 Todleben succeeded the Grand-Duke Nicholas as Commander-in-Chief of the army in Turkey, and in December following was appointed general of the 7th Grenadiers, and by special ukase the regiment received his name. He died in Soden, Germany, July 1, 1884.

**Tody,** the name of certain tropical birds genus *Todus,* family *Todidæ.* They are birds of gaudy plumage, and feed on insects, worms, etc. The most elegant species is the *T. regius* (royal or king tody), a native of Cayenne and Brazil. The green tody (*T. viridis*) is also a pretty bird, about the size of a wren. It is very common in Jamaica.

**Toe,** one of the small members which form the extremity of the foot, corresponding to a finger on the hand. The forepart of the hoof of a horse, and of other hoofed animals. The member of a beast's foot corresponding to the toe in man.

**Toft,** a grove or thicket of trees, sheltering a homestead, and sometimes surrounding it. In old deeds it is commonly joined to croft, another Anglo-Saxon word meaning an inclosed field.

**Tofieldia,** or **Toffieldia,** the Scotch asphodel; a genus of *Veratreæ.* Perianth six-partite, with a small three-partite involucre. Stamens six, capsule three to six-celled, cells united at the base, many-seeded. Known species 10, from the N. temperate zone. *T. palustris* (or *borealis*) is an alpine plant, with tufted three to five-nerved leaves, and a scape of dense racemose flowers of a pale-green color. Found also in the N. of Continental Europe, in Northern Asia, and in North America.

**Toga,** the principal outer garment and characteristic national dress of the ancient Romans, who were hence designated as emphatically the *Gens Togata* ("the toga-wearing nation"), while the Greek pallium distinguished foreigners. The right of wearing it was the exclusive privilege of citizens, its use being forbidden to Peregrini and slaves. It was, moreover, the garb of peace, in contradistinction to the sagum of the soldier. The shape of the toga and the way in which it was worn are much disputed. In outline it was probably slightly curved. The ordinary mode of wearing it was to throw the whole toga over the left shoulder, leaving one extremity to cover the left arm, and to bring it round the back and under the right arm, which remained at liberty, the second end being carried again over the left shoulder. In this way, the broadest part of the cloth hung down in front, a large bunch or mass of plaits, termed *umbo,* lay across the breast, and the second extremity, which was carried across, served as a sort of belt to secure the whole. It was a loose robe, made of wool, sometimes of silk. Boys, till they attained to manhood, and girls, till they married, wore the *toga prætexta,* a cloak with a purple or scarlet border. When the young Roman was regarded as fit to enter on the business of life (at what age this was is uncertain, probably it depended on circumstances), he threw off the *toga prætexta,* and assumed the *toga virilis.* The *toga prætexta* was also the official dress of the higher magistrates. The *toga picta,* an embroidered robe, was worn by a general in his triumphal procession. Candidates for any office wore a *toga candida,* that is a toga which had been artificially whitened by the application of chalk or other similar substance; so arrayed they were styled *candidati* (whence our word candidate). Mourners wore a *toga pulla* of naturally black wool.

**Toggel,** nautically, a double cone of wood, firmly fixed in a loop at the end of a rope. By passing the toggel through another small loop in another rope, a strong junction is easily formed, which can be cancelled in a moment. Toggels are very useful in bending flags for signals.

**Toggle Press,** a form of press having especial value for many purposes, as the motion of the platen is more rapid at the time when the toggle-bars are starting from the point of their greatest flexion, and, as they straighten out, the power increases and rate diminishes as the point of ultimate pressure on the bale is approached. One of the most familiar forms is the Stanhope printing press, in which the platen is depressed by a toggle and raised by springs. The movement is variously known as a knuckle, knee, or elbow movement, and is also used for making electrotype molds from type, and for compressing bales of cotton, hay, etc.

**Toise** (twäz), formerly in France the unit of linear dimension, equivalent to 1.94 metres, or 6.39 English feet.

**Toison d'Or.** See Golden Fleece, Order of the.

**Tokay** (tō'koi), a town of Hungary, at the confluence of the Bodrog with the Theiss; 113 miles N. E. by E. of Budapest. It derives its celebrity from its being the entrepôt for the sale of the famous sweet wine of the same name, made in the hilly tract called the Heyaltya, extending 25 or 30 miles N .W. from the town. When new, Tokay wines are of a brownish-yellow muddy color, which, when very old, changes to a greenish tint. The best qualities are extremely rich and luscious, but cloying. The finest and oldest varieties of Tokay bring

large prices. Inferior Hungarian wines are frequently sold under this name, and many French and German imitations are also in the market. Pop. (1900) 5,110.

**Tokens,** pieces of money current by sufferance, and not coined by authority; or coins only nominally of their professed value. In England tokens first came into use in the reign of Henry VIII., owing to the want of authorized coins of value lower than a penny. Stamped tokens of lead, tin, and even leather were issued by vintners, grocers, and other tradesmen during the time of Elizabeth, and were extensively circulated, being readily exchanged for authorized money at the shops where they were issued. A currency of this kind (mostly of copper) was much used in Great Britain during the close of the 18th century, and was used in the United States during the Civil War.

**Tököly, Emeric, Count,** a Hungarian patriot; born in the castle of Käsmark, in the comitat of Zip, in 1656; on the death of his father, a Protestant noble and insurgent (1671), fled to Transylvania. Here Prince Apafi gave him the command of troops, with which, in 1678, joining the Magyar patriots, he ravaged Moravia, took Kaschau (1682), and marched with the Turks on Vienna. Treacherously arrested by Kara Mustapha (1685) and sent to the Sultan at Adrianople, Tokoly was released in 1686 and furnished with 9,000 Turkish soldiers for further operations against Austria. Created Prince of Transylvania, he defeated Heusler at Yernesi (1689), but was compelled to retreat before the Prince of Baden into Wallachia. He later shared in almost all the Turkish operations against the Austrians, and, excluded from the amnesty that followed the peace of Karlowitz (1699), lived at Constantinople, dying on his estate of Ismid, Sept. 13, 1705.

**Tokyo,** formerly called YEDDO, the capital of Japan, and chief residence of the mikado; on a bay of the same name; on the S. E. coast of Hondo, the largest of the Japanese islands, and connected by rail with Yokohama and Kanagawa. The bulk of the houses are of wood, but there are many new buildings of brick and stone, and an imperial palace has been erected near the center, as also public offices, etc. The greater part of the town is flat, and intersected by numerous canals crossed by bridges. The streets are generally narrow and irregular. Gas has been introduced, and the sanitary arrangements have been improved. Education is well organized, and there are nearly 700 private and elementary schools. Tokyo contains the imperial university, and it may be considered the center of the political, commercial, and literary activity of Japan. Pop. (1908) 2,186,079.

**Tolally Sulphide,** $(C_7H_5)_2S$; a product obtained by the dry distillation of sulphide or disulphide of bezil. After repeated crystallization from alcohol, it forms a white crystalline powder, very sparingly soluble in alcohol, easily in ether, and melting at 143°–145°.

**Toland, Janus Junius,** an English deist; born in Redcastle, Ireland, Nov. 30, 1670. He studied at the universities of Glasgow, Edinburgh (where he took the degree of M. A. in 1690), Leyden, and Oxford. In 1696 he published his famous work, "Christianity not Mysterious" (first two editions anonymously, 3d, 1702, with name). The work was to consist of three parts, of which the first done was unpublished. In the first it was affirmed that among the very essentials of true religion were clearness and intelligibility, and that these were contained in Christianity. The second was to be a rational explanation of the reputed mysteries of the Gospels; the third was to show that nothing unreasonable was contained in the Evangelists. The general scope of the book was to limit the sphere of the supernatural, not to reject it altogether; but notwithstanding this it created an immense uproar. The clergy thundered against it from the pulpit, or wrote in refutation of his arguments. In 1697 Toland visited Ireland, in the wake of his unpopular work, but found no toleration of its doctrines there. The Irish Parliament, who would have disdained not merely to read but to touch the work, severely condemned at once the book and the author. The former was burnt by the common hangman of the city of Dublin, with an imposing display of civic ceremony, and the Lower House of Convocation of the Irish Church, in condemning the book, blamed Parliament for not extending a similar punishment to the latter. Toland, who was an intensely vain man, was delighted at this uproar, till it became too furious, and he was obliged again to remove from Ireland. The rest of Toland's life was a troubled one. He was in want of money, and had to support himself by doing any stray piece of work that he could procure. His other writings were for the most part fragmentary. The chief were: "Life of Milton" (1698); "Anglia Libra (1701); "Socinianism Truly Stated" (1705); "Nazarenes" (1718); "Tetrydymus" (1720); "Pantheisticon" (1750). The last of these works "amounts to a distinct avowal by Toland of "Pantheism." He died in Putney, March 11, 1722. A man of inordinate vanity, Toland nevertheless possessed considerable powers of mind, and an ardent love of knowledge and speculation. To estimate his full importance he must be known

in connection with the religious history of his own day.

**Tolane,** $C_{14}H_{10}$; has the constitution of diphenyl acetylene, $\begin{matrix} C(C_6H_5) \\ C(C_6H_5) \end{matrix}$, and is obtained by boiling stilbene bromide with alcoholic potash. It forms large crystals melting at 60°, easily soluble in alcohol and ether.

**Toldy, Franz** (tol'dē), a Hungarian historian of literature; born in Budapest, Aug. 10, 1805. He was professor of Hungarian literature at Budapest, and wrote: "Manual of Hungarian Poetry" (1828); "History of the Hungarian National Literature" (1851); "History of Hungarian Poetry" (1857). He died in Budapest, Dec. 10, 1875.

**Toledo,** a city of Ohio, a port of entry, and county-seat of Lucas co. It is situated on both sides of the Maumee river, near the point of its discharge in Maumee bay, an arm of Lake Erie, about 100 miles W. of Cleveland, 130 miles N. of Columbus, and 234 miles E. of Chicago. The city extends up the river as far as 9 miles from its mouth, covers an area of 28.57 square miles, and had a population estimated locally in 1907 at 180,660. It is the third city of the State in population.

*Streets and Parks.*—The city is built in large part on ground made where formerly there was a swamp. The slope on both sides of the river is gradual. In its course through the city, the Maumee river averages half a mile in width, is navigable for the largest lake steamers, and is spanned by five railroad and two passenger bridges. The principal business section is on the left bank. The streets are wide, and have a total length of 412 miles. Nearly the whole of this is provided with sidewalks and lighted by electricity, while about one-half is paved, principally with stone and asphalt. The streets of the residential sections are lined with numerous shade trees, and the houses are surrounded with unfenced grounds, thus producing a park-like effect. The best residential section is near the W. limits of the city, and has come into existence since about 1888. In laying out this new section, the old trees were largely preserved.

The park system embraces about 910 acres. The principal parks of the east side are Collins park (70 acres) and Navarre park (53 acres), while those on the west side are: Bay View park (202 acres), situated at the mouth of the river; Riverside park (63 acres), situated further up the river; Walbridge park (62 acres), situated on a bluff 75 feet high, which affords a fine view of the river, and containing a zoölogical garden and a greenhouse; Central Grove park (100 acres); and Ottawa park (280 acres), on the western side of the city, with a fine public golf course. These parks are partially connected by a boulevard from 150 to 200 feet wide. There are also in the more populous sections of the city several neighborhood parks, triangular spaces, and public playgrounds for children.

*Buildings, Churches, and Charities.*—Among the notable public or semi-public buildings are: The county court house, in the center of the city, with a bronze statue of President McKinley in front of it, the Soldiers' Memorial building, the armory, the public library, the Masonic temple, the Valentine Theater, the Hotel Secor, erected in 1907, the Toledo Club house, and the Terminal depot. The Spitzer, Nasby, Ohio, Gardner, and Nicholas buildings are prominent among modern business structures. There were in 1907 126 churches of all denominations, among which St. Patrick's (R. C.), St. Paul's (Methodist), the Collingwood Avenue (Presbyterian), and St. Mark's (Episcopal) are architecturally conspicuous. The largest hospitals are the State-supported hospital for the insane, which is conducted on the cottage plan and has accommodations for 1,700 patients; the Toledo Hospital, which is supported by voluntary contributions; and the Roman Catholic St. Vincent's Hospital. Besides these there are a Roman Catholic hospital for the aged, a number of private hospitals, a Lutheran orphans' home, a home for foundlings, a day nursery, and numerous other benevolent institutions.

*Education.*—The public school system consisted in 1907 of two high schools with about 2,100 pupils; one manual training school with 350 pupils; one training school for teachers with 75 pupils; and 42 elementary schools with 30,000 pupils. The teaching force numbers 700. Text books are free, there is a kindergarten in connection with each elementary school, and manual training forms an integral part of the entire school system. The board of education consists of five members, two elected from districts and three at large, and the annual expenditure is about $700,000. The Roman Catholic Church maintains a number of parochial schools, two academies for girls, and St. John's College, an institution for boys. There are also two large commercial schools, and the Toledo Medical College is a flourishing institution. The public library, with five sub-stations, has over 73,000 volumes, and the art museum, occupying a building of its own, is a growing institution. Among the local newspapers, the "Blade" enjoys a national reputation, although the "News-Bee" has the larger circulation.

*Industries.*—According to the United States Census of Manufactures for 1905, Toledo ranks fourth among the cities of Ohio in regard to its industrial activities.

Fully 28 new industries were established in the city between 1900 and 1905. One of the latest among these is that of slaughtering and meat packing, the stock yards having been opened in March, 1905. The glass factories were attracted to the city by the exceptionally good sand deposits in its vicinity, the ease of obtaining soda ash in unlimited quantities, and above all the cheapness of the fuel. Natural gas, formerly found in abundance in northwestern Ohio, served as a very cheap fuel, but of late years, because of limited supply, it has been superseded in factories by soft coal from the Ohio fields. Natural gas, however, piped from the West Virginia field by the Northwestern Ohio Gas Company, a branch of the Standard Oil Company, is used in homes extensively for heating and cooking, and to a limited extent in smaller factories. The abundant clay deposits gave rise to the brick industry. Lime, cement, and other building supplies are also produced. The canning of vegetables is carried on extensively. Not only wooden boats, but also ocean-going steel vessels of moderate size are built, and the drydock for repairing damaged shipping is one of the largest on the Great Lakes. During the year ending June 30, 1906, 3 steam vessels of 7,635 gross tonnage were constructed. The industry that turns out the most valuable product—owing to the great value of the raw material—is that of roasting and grinding coffee and spice; but in order to avoid disclosing individual operations, no statistics are published either of this industry, or of iron and steel, linseed oil, glass, automobiles, iron and steel ships, and several other important industries. Among those of which the statistics are published, by far the most important is that of foundry and machine shop products, which in 1905 was carried on in 45 establishments with $4,023,000 of capital, employing 2,461 wage-earners (exclusive of salaried officials and clerks) who received $1,346,000 in wages, with miscellaneous expenses—rent, interest, taxes, etc. —amounting to $370,000, the cost of materials used $1,783,000, and the value of products aggregating $4,087,000. Toledo is the center of the flour and grist mill industry of the State, the product in 1905 having been valued at $3,676,000. Refining petroleum, with products valued at $2,006,000, was the industry next in importance. The following industries each reported products valued at over $1,000,000: Malt liquors, lumber and planing mill products, children's carriages and sleds, women's clothing, car construction and repairs by steam railroad companies, bread and other bakery products, carriages and wagons, and structural iron work. Other important industries were: Brick and tile, brooms and brushes, carriage and wagon materials, furniture, awnings, tents, sails, etc. The growth of the industries of Toledo since 1880 is shown in the following table:



| Year | Number of Establishments | Capital | Wage-Earners | Wages | Cost of Materials Used | Value of Products |
|---|---|---|---|---|---|---|
| 1880 | 440 | $5,534,000 | 6,738 | $2,260,000 | $6,355,000 | $10,600,000 |
| 1890 | 734 | 12,700,000 | 9,247 | 4,333,000 | 12,190,000 | 21,652,000 |
| 1900 | 1,050 | 25,592,000 | 15,383 | 6,846,000 | 21,987,000 | 37,372,000 |

The special United States Census of Manufactures for 1905 was confined to the true factory industries, to the exclusion of neighborhood industries and hand trades. Compared with the corresponding industries for 1900, the growth is shown in the following table:

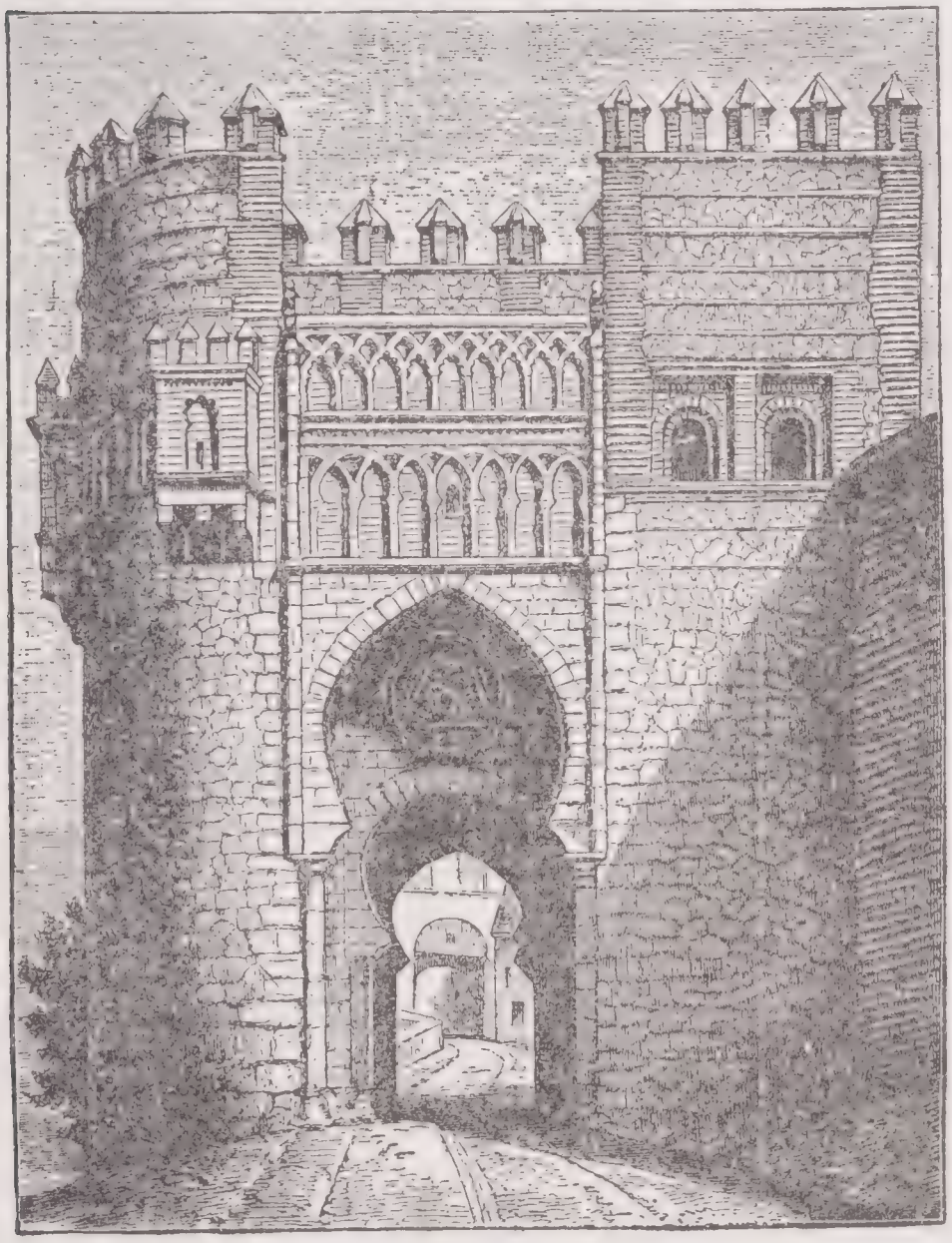
| Year | Number of Establishments | Capital | Wage-Earners | Wages | Cost of Materials Used | Value of Products |
|---|---|---|---|---|---|---|
| 1900 | 445 | $23,788,000 | 12,747 | $5,576,000 | $19,397,000 | $31,976,000 |
| 1905 | 599 | 38,643,000 | 15,759 | 8,126,000 | 25,681,000 | 44,823,000 |
| Per cent. Increase | 34.6 | 62.4 | 23.6 | 45.7 | 32.4 | 40.2 |

According to local information the capital invested in these factories had risen in 1906 to nearly $41,000,000, and the value of the products to nearly $49,000,000.

*Commerce and Transportation.*—Owing to its favorable location and its extensive industries, Toledo is one of the great centers of commerce on the Great Lakes. It is a great jobbing center, the wholesale shoe business alone amounting to $7,000,000 annually. As a market for clover-seed, it ranks foremost in the United States. It is one of the principal ten grain markets in the country, the receipts of grain in 1906 having amounted to 19,114,000 bushels, while in 1900 they reached the exceptionally high figure of 41,840,000 bushels. The receipts of iron ore from the Lake Superior region by lake amounted to 1,430,069 tons in 1906, against 1,005,129 tons in the preceding year, and the shipments of soft coal from Pennsylvania, Ohio, and West Virginia to the ports on the upper lakes amounted in the same year to 959,997 tons, against 793,071 tons in 1905. Toledo also receives hard coal, lumber, railway ties, sugar, salt, flax, fish, general merchandise, etc., and ships corn, wheat, flour, etc. The total net tonnage in the domestic lake traffic entered in 1906 was 2,121,624, and that cleared, 2,181,426, against 1,659,264 and 1,727,498 net tons respectively in 1904. The foreign trade amounted in 1906 to $487,878 for imports and $1,129,158 for exports. To carry on this

Toledo

large lake traffic, Toledo has over 18 miles of dock front on the Maumee river, which serves as its harbor, besides a practically unlimited dockage capacity along the Ottawa river, to the northwest of the city, and along the shores of Maumee bay. Through the latter, the United States government has dredged a straight channel 400 feet wide and 21 feet deep, and having a length of 8 miles from the mouth of the river, besides its extension through the river itself, which is of about the same length. The gradual slope of the river banks enables the railroads to run their tracks to the water edge, where entire carloads of coal and iron ore are discharged by machinery into the holds of a vessel, a carload at a time. Twenty railways enter the city, including the Lake Shore, the Wabash, the Ohio Central, the Pennsylvania, the Hocking Valley, the Père Marquette, the Cleveland, Cincinnati, Chicago and St. Louis ("Big Four"), the Wheeling and Lake Erie, the Ann Arbor, the Michigan Central, and others. Direct water communication is maintained with the interior by means of the Wabash and Erie canal, reaching to the fertile valley of the Wabash river in Indiana, and the Miami and Erie canal, which reaches the Ohio river at Cincinnati. There were in 1907 eight interurban electric railways, reaching out as far as Cleveland and Detroit. The local electric surface lines have a length of over 110 miles.



PUERTO DEL SOL, TOLEDO.

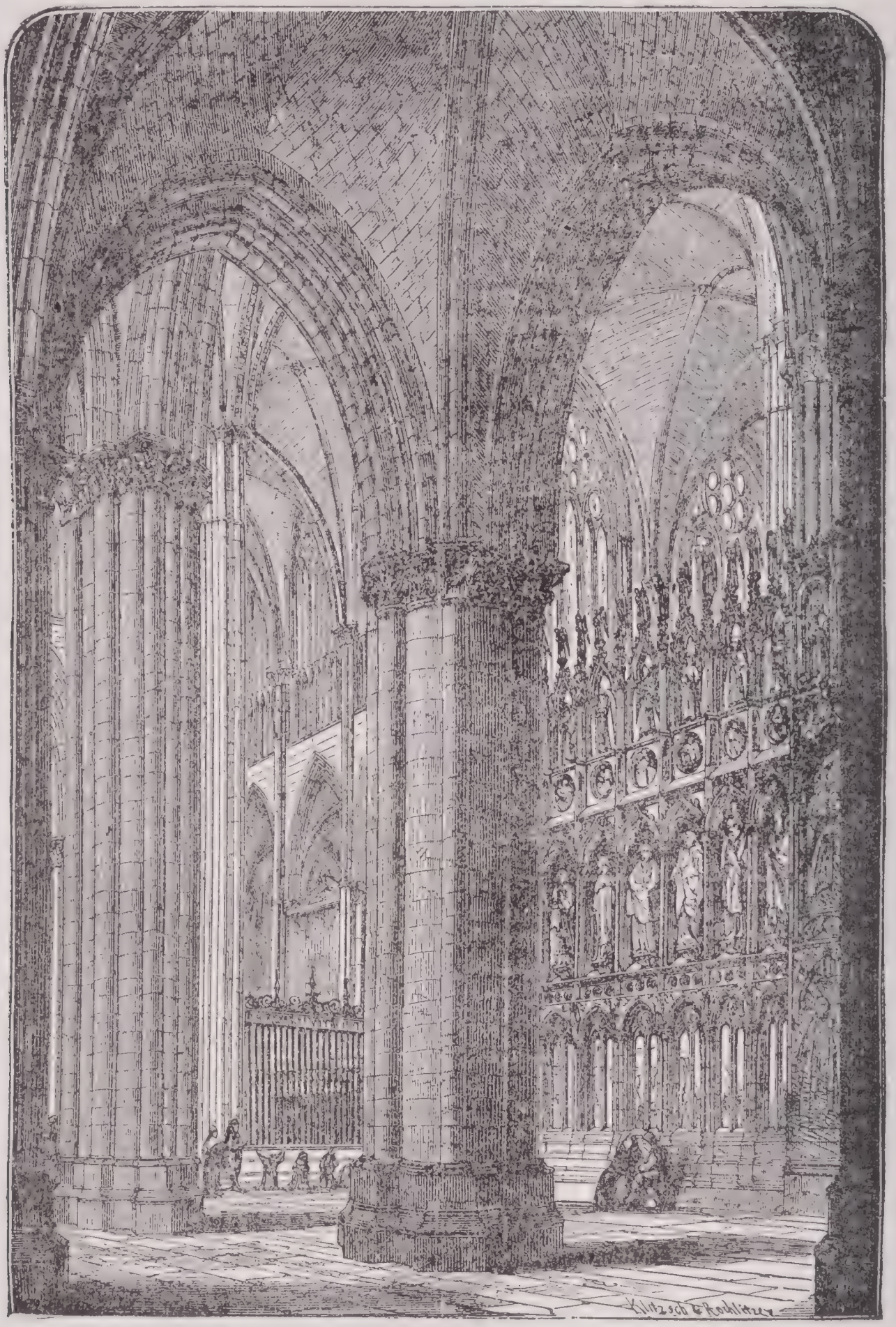
The growth of the city's business is reflected in the transactions of the clearing house, which have increased from $73,501,000 in 1896 to $211,255,000 in 1906. In the last-mentioned year there were 6 National and 17 State banks, with a combined capital and surplus of $10,284,000, and deposits of $32,633,000.

*Administration and Public Interests.*—The city is governed in accordance with the Municipal Code of Ohio. The chief executive is the mayor, elected for two years. The other elective officials are the members of the board of public service, which has charge of public works and municipal charities, the treasurer, the auditor, and the solicitor. The mayor appoints all other city officials, including the three members of the board of public safety, which has charge of the police and fire departments. The council is composed of 16 members, one from each of the 13 wards, and three elected at large. The city owns its water works and a cemetery. The administration of the workhouse has been modernized, and the parole system introduced. A juvenile court has jurisdiction of delinquent children. The municipal expenditure is about $1,600,000 annually. The total indebtedness amounted on May 22, 1907, to $7,363,809.

*History and Population.*—The Maumee river was an important route of travel used by Indians and white traders. The first settlement within the present limits of the city was made by a company of speculators at the mouth of Swan creek, which empties into the Maumee, in 1817, and was called Port Lawrence. A second settlement, named Vistula, was made in 1832 at what is now the foot of Lagrange street, a mile further down the river. The two settlements were consolidated in 1833, when the name of Toledo was adopted, and incorporated as a city in 1846. The first locomotive entered the city in 1837 from Adrian, Mich. The Wabash and Erie canal was opened in 1843, and the Miami and Erie canal in 1845. Population, 1840, 1,222; 1850, 3,829; 1860, 13,768; 1870, 31,584; 1880, 50,137; 1890, 81,434; 1900, 131,822; 1910 (census) 168,497. In 1900 the pop-

ulation consisted of 65,604 males and 66,218 females. The negroes numbered 1,710, and the foreign born, 27,822 (21.1 per cent. of the total), the most numerous elements being Germans, Poles, and Canadians.

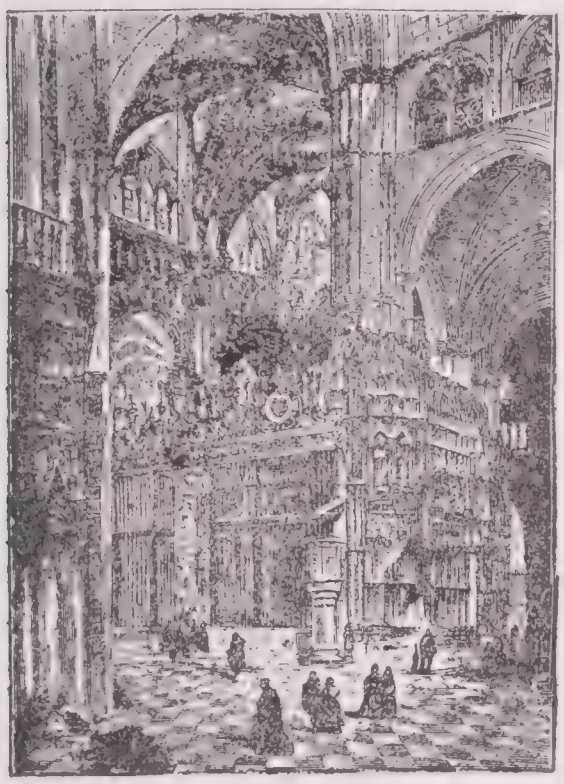
*Revised by* GEORGE W. EOFF.



INTERIOR OF THE TOLEDO CATHEDRAL.

**Toledo** (tō-lā′*th*o), a famous city of Spain; capital of a province, and long the capital of the whole country; on the N. bank of the Tagus, by which it is encompassed on three sides, 40 miles S. S. W. of Madrid. It is situated on a number of hills, 2,400 feet above sea-level; and the climate, excessively hot in summer, is bitterly cold in winter. The Tagus, surrounding the city on the E., S. and W., and flowing between high and rocky banks, leaves only one approach on the land side, which is defended by an inner and an outer wall, the former built by the Gothic King Wamba in the 7th

century, the latter by Alfonso VI. in 1109, and both remarkable for the number and beauty of their towers and gates. Seen from a distance the city has a most imposing appearance; within it is gloomy, silent, inert, and its narrow streets are irregular, ill-paved, and steep. In the middle of the city rises the lofty, massive cathedral, surrounded by numerous churches and convents, mostly deserted. The cathedral, built in 1227–1493, on the site of a former mosque (consecrated to Christian uses in 1086, but pulled down to make way for the new church), is a large oblong edifice with semicircular apse, and belongs to the simplest, noblest style of Spanish-Gothic, with a few touches of the florid Gothic, classical, and Saracenic styles. The



TOLEDO CATHEDRAL; ANOTHER INTERIOR.

interior is more impressive than the exterior, which is blocked by other buildings on all sides save one. It was ransacked and plundered in 1621 and 1808, but it still contains some admirable stained glass, and the choir is a perfect museum of sculpture. The cathedral is 404 feet long and 204 feet wide, and has five naves; the tower is 329 feet high. Connected with the cathedral are an extraordinary number of chapels, of great interest, alike from their architectural beauty, their decorations, and their historical associations. The great square or Zocodover, thoroughly Moorish in its architectural character, is a fashionable promenade, and was long the site on which heretics were burned and bull-fights took place. Moorish architecture is conspicuous in some churches, and in two gateways. The Alcazar, or old palace, the fortress commanded by the Cid, rebuilt as a palace in the time of Charles V. and subsequently, occupied the highest part of the city, but was burned down in 1887. The buildings of the town include a theological seminary, one or two old palaces, hospitals, what was once a great monastery, town hall, etc. There are manufactures of church ornaments and vestments in gold, silver, and silk, and confections. The best Spanish is said to be spoken here. Toledan sword blades, famous since old Roman times, are still made, outside the city. Pop. (1900) 23,375.

Toledo, the Toletum of the Romans, is of very early origin. It was the capital of the Goths during their dominion; in 714 it fell into the possession of the Moors, who retained it till 1085, when it was permanently annexed to the crown of Castile as capital. In the days of its highest prosperity it is said to have contained 200,000 inhabitants. It was the headquarters of the Inquisition. The university, founded in 1498, is long since extinct. The whole place has now a dilapidated and broken-down appearance.

**Toledoth Jeshu** (Hebrew, "the generations of Jesus"), an apocryphal work in Hebrew purporting to be a history of Jesus; really a mediæval series of clumsy, fragmentary, ribald fictions and burlesques. There are two recensions, of one of which Wagenseil published a Latin translation in 1681. This one may probably contain an ancient element; the other, which Huldrich translated into Latin in 1705, is not older than the 14th or 15th century.

**Tolentino** (tō-len-tē′nō), a small town of Central Italy, in the province of Macerata, with a fine cathedral. Here Pope Pius VI., in 1797, concluded a humiliating peace with Bonaparte, and in the neighborhood, in 1815, Murat, at the head of the Neapolitans, was defeated by the Austrians under Bianchi.

**Toleration,** the act of tolerating or enduring; allowance of something not wholly approved. Specifically, the recognition of the right of private judgment in matters of faith and worship; the liberty allowed by a government to every individual to hold or publicly teach his own religious opinions, and to worship how, when, and whom he pleases, provided he does not violate thereby the rights of others or infringe laws made for the maintenance of decency, morality, and good order, or for the security of the State.

"Toleration is of two kinds: The allowing to the dissenters the unmolested profession and exercise of their religion, but with an exclusion from offices of trust and emolument in the State, which is a partial toleration; and the admitting them, without distinction, to all the civil privileges and capacities of other citizens, which is a complete toleration."— Paley, "Moral Philosophy," bk. vi., ch. x.

There was no toleration under the Jewish theocracy or the semi-theocratic monarchy; the individual who worshiped false gods, or who induced others to do so, was

regarded as a traitor against Jehovah, and received the ordinary punishment of a traitor — death. (Num. xxv: 1-11, Deut. xiii: 1-18, I Kings xviii: 40.) The spirit of the New Testament is distinctly in favor of toleration (Acts. x: 34, 35). The old Roman empire was, as a rule, tolerant. The images worshiped by the several nationalities constituting it, or with which it was brought in contact as its conquests extended, all received a certain welcome; and one of the chief reasons why Christianity was persecuted was that it was not contented to be one of a number of accepted faiths, but claimed to be the one only true religion, proselyting from all the rest. Hinduism holds essentially the same position. Mohammedanism recognizes no proper religious liberty, and when it has the power is a most intolerant faith, though it is sometimes compelled to come to terms of accommodation with a rival faith, as was the case in India.

A Church established or dominant is apt to regard those who dissent from its doctrines or ritual as committing a grave offense, and to treat them intolerantly; they, on the contrary, contend for religious liberty. If, however, the positions of the two were reversed, it would be found that, in many cases, a corresponding change of views would occur. The standpoint of a government is different; its tendency is to toleration. If the members of the several denominations are willing to pay taxes and avoid exciting commotion, the government generally acts tolerantly to them, and is the more moved to do so if it finds that it runs the risk of crushing defeat when it measures its strength against that of the human conscience. In Article VI. of the Constitution of the United States it is ordained that "No religious test shall ever be required as a qualification to any office or public trust under the United States"; and in Article I., in addition to an amendment of the Constitution, it is further ordained that "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof." The philosophic view was expressed by John Stuart Mill when, in answer to a query put to him in connection with a parlimentary election, he answered: "There should be no religious disabilities." The word toleration does not now figure in England in controversy so largely as it did, the chief Nonconformists no longer contending for it, but aiming at religious equality.

Also a disposition to tolerate, or not to judge or deal harshly or rigorously in cases of difference of opinion or conduct; freedom from bigotry.

**Toleration Act,** the name given to a statute of William and Mary, under which freedom of worship was granted to Protestant dissenters from the Church of England, provided they made a declaration against transubstantiation, and took the oaths of allegiance and supremacy. This act has been so amended and extended from time to time that now all dissenters, Roman Catholics, Jews, and all other sects alike enjoy all the privileges of the constitution.

**Toletum,** the ancient name of Toledo, Spain.

**Toll,** a tax paid, or duty imposed, for some liberty or privilege or other reasonable consideration; such as (*a*) the payment claimed by the owners of a port for goods landed or shipped there; (*b*) the sum charged by the owners of a market or fair for goods brought to be sold there; (*c*) a fixed charge made by those intrusted with the maintenance of roads, streets, bridges, etc., for the passage of persons, goods, and cattle.

**Tollens, Hendrik Caroluszoon** (tol'lens), a Dutch poet; born in Rotterdam, Sept. 24, 1780. Among his best works are: "Idylls and Love Songs" (1801–1805); "Poems" (1808–1815); "Account of the Winter Spent by the Dutch at Nova Zembla" (1816); "Romances, Ballads, and Legends" (1818); "New Poems" (1821); "Various Poems" (1840); "Last Poems" (1848–1853). He died in Ryswick, Oct. 21, 1856.

**Tolman, Herbert Cushing,** an American educator; born in South Scituate, Mass., Nov. 4, 1865; was educated at Yale and Berlin Universities; Instructor of Latin at the University of Wisconsin in 1892–1893; acting Professor of Greek and Professor of Sanskrit at the University of North Carolina in 1893–1894; became Professor of Greek at Vanderbilt University in the latter year. His publications include: "Harper and Tolman's Cæsar's Gallic War" (1891); "Tolman's Persian Inscriptions" (1892); "Kerr and Tolman's Greek Gospel of Matthew" (1892); "Harrington and Tolman's Greek and Roman Mythology" (1897); "Tolman and Stevenson's Herodotus and the Empire of the East" (1899); "Art of Translating" (1900); "Index of Rites to the Grihya Sutras"; etc.

**Tolmen, Constantine.** See CONSTANTINE TOLMEN.

**Tolosa.** See TOULOUSE.

**Tolstoy, Count Aleksii Konstantinovich** (tol'stoi), a Russian author; born in St. Petersburg, Russia, Aug. 24, 1817. He wrote a number of ballads and lyric poems; one novel, "Knĭaz (Prince) Serbrĭanyi" (translated by Jeremiah Curtin, 1893); a short drama, "Don Juan"; and a trilogy, "The Death of Ivan the Terrible" (1865), "Czar Feodor Ivanovich" (1868), and "Czar Boris" (1870). He died near St. Petersburg, Sept. 28, 1875.

**Tolstoy, Count Lyof** (or **Lev,** English **Leo**) **Alekséevich,** a Russian novelist; born on the family estate of Yasnaya Polyana in the province of Tula, Russia, Sept. 9, 1828. He served in the Crimean War, and afterward traveled extensively. In 1861 he took up permanent residence on his country estate. Among his earliest works are: "Detsvo" (Childhood), "Otrchestvo" (Boyhood), and "Iunost" (Youth); also "Cossacks," "Sevastopol," and a number of military sketches. "War and Peace" was published in 1865–1868; "Anna Karénina" in 1875–1878. His peculiar doctrines are promulgated in "My Confession," "In What My Faith Consists," etc. His later works are "The Kreutzer Sonata"; "Death of Ivan Ilyitch"; "Master and Man." In 1901 he was excommunicated by the Holy Synod because of his writings, and in 1908 his eightieth birthday was popularly observed throughout Russia despite the Holy Synod's special ban, and the Government, which first prohibited and then permitted public observances. He died Nov. 20, 1910.

**Toltecs,** a Mexican race who are supposed to have been supreme in Central America from the 7th to the 11th centuries. They were completely obliterated by the Aztecs (*q. v.*) and Tezcucans, who held the country when the Spaniards first landed. The Toltecs present striking analogies to the Etruscans, and in a less degree to the Egyptians and Assyrians. They were great builders, and their religion was a mystic system of great complexity, intimately connected with the study of astronomy, and interpreted by a priesthood, who formed an exclusive caste. See Prescott's "History of the Conquest of Mexico," book i.

**Tolu Balsam,** a resin or balsam obtained from a tree of tropical South America, the *Myrospermum* (*Myroxylon*) *toluiferum* or *Peruiferum.* Tolu balsam has a brownish-yellow color, becomes quite hard and may be formed into a powder, has a pleasant aromatic flavor, and is used in certain medicinal preparations, though having little or no virtue of its own.

**Tolúca** (-lö'kä), a town of Mexico, capital of Mexico State; 45 miles W. S. W. of Mexico city, in a valley nearly 8,800 feet above the sea. It contains a fine cathedral, manufactures paints, soap, and candles, and has a thriving trade in pork, sausages, etc. Near the town is the extinct volcano, Nevado de Tolúca. Pop. (1900) 25,940.

**Toluene,** $C_7H_8 = C_6H_5(C_6H_3)$; tolin; produced by the action of sodium on a mixture of bromobenzene and methyl iodide, and also occurs in light coal-tar oil. It is a limpid liquid smelling like benzine and having a nearly similar solvent power; sp. gr. =.882 at 0°, boils at 111°. Passed through a red-hot porcelain tube, it yields various compounds, among which have been observed benzine, naphthalene, dibenzyl, and anthracene.

**Toluene Sulphamide,** $C_7H_7 \cdot SO_2 \cdot NH_2$; produced by the action of aqueous ammonia on toluene sulpho-chloride. It crystallizes from hot water in needles or in laminæ.

**Toluene Sulpho-chloride,** $C_7H_7SO_2Cl$; obtained by triturating toluene-sulphate of sodium with an equal weight of phosphoric pentachloride, and several times washing the product with water. It separates from ether in rhombic plates or large prisms, melts at 68°, and boils with decomposition at 250°. It is insoluble in water, but dissolves in alcohol, ether, and benzine.

**Toluene Sulphuric Acid,** $C_7H_7SO_3H$; formed by the action of fuming sulphuric acid on toluene from tolu balsam. It crystallizes in small, very deliquescent laminæ.

**Toluene Sulphurous Acid,** $C_7H_7SO_2H$; obtained by treating toluene sulpho-chloride, dissolved in ether free from water or alcohol, with sodium amalgam. It crystallizes from water in rhombic tables, having a brilliant satiny luster, melting at 85°, and dissolving easily in boiling water, alcohol, ether, and benzine. It passes by oxidation into toluene sulphuric acid.

**Toluic Acid,**

$$C_8H_8O_2 = C_6H_4 \begin{cases} CH_3 \\ CO_2H \end{cases} = CH_2 \begin{cases} C_6H_5 \\ CO_2H. \end{cases}$$

Four acids are known; Ortho-, para-, meta-, and alpha-. The first three are formed by oxidation of the corresponding xylenes, and the last by treating benzyl cyanide with alkalies. Ortho- crystallizes in long slender needles, melting at 102.5°, and is moderately soluble in hot water; para- crystallizes in needles, melting at 178°; meta- yields slender needles, melting at 109°, and more soluble in water than ortho- or para-. The alpha- acid crystallizes in broad, thin laminæ, smells like horse-sweat, melts at 76.5°, and boils at 261°.

**Toluic Aldehyde,** $C_8H_7OH = C_7H_7COH$; produced by distilling a mixture of toluate and formate of calcium. The distillate, treated with acid sulphite of sodium, forms a crystalline compound, which on addition of carbonate of sodium, yields the aldehyde as an oil. It has a peppery odor, boils at 204°, and when exposed to the air takes up oxygen, and becomes converted into toluic acid.

**Toluic Chloride,** $C_8H_7OCl$; produced by distilling toluic acid with phosphoric pentachloride. It is a strongly refracting, colorless liquid; sp. gr. = 1.175, boils at 214°, and fumes in moist air.

**Toluic Ether,** $C_8H_7(C_2H_5)O_2$; ethylic toluate; prepared by passing hydrochloric acid gas into an alcoholic solution of toluic acid. By the addition of water it separates as a

heavy oil which, when washed with ammonia and dried over chloride of calcium, is obtained as a colorless, aromatic liquid, having a bitter taste, and boiling at 228°.

**Toluides,** compounds, homologous with the anilides, derived from toluidine salts of organic acids by abstraction of water. They may be regarded as amides containing the radical tolyl.

**Toluidene,** $C_7H_6$; an aldehyde radical, the bromide of which, $C_7H_6Br_2$, is obtained by the action of phosphoric pentabromide on bitter almond oil, $C_7H_6O$.

**Toluidine,** $C_7H_9N = C_6H_4(NH_2)CH_3$; a base, metameric with benzylamine, exhibits the three modifications of ortho-, meta-, and para-, which are obtained by the action of reducing agents on the corresponding nitrotoluenes. Paratoluidine forms large, colorless crystals, sparingly soluble in water, easily in alcohol and ether, melts at 45°, boils at 198°, and has an aromatic taste and odor; the ortho-compound is a colorless neutral liquid having the density of water, and boiling at 199.5°; and the meta- is a colorless liquid of a sp gr. of .998 at 15°, and boiling at 197°. Commercial toluidine is a mixture of the para- and ortho-compound, and enters into the composition of the aniline dyes.

**Toluonitril,** $C_8H_7N = C_6H_4(CN)CH_3$; cyanotoluene. Three isomeric modifications of this compound are known, formed by treating the respective tolyl-sulpho-carbimides, $N\left\{\begin{matrix}CS\\C_6H_4CH_3,\end{matrix}\right.$ with finely divided copper to remove the sulphur. The ortho-compound is a colorless liquid, boiling at 203°; the para- yields colorless needles, melting at 28.5°, boiling at 218°; the meta- has not yet been obtained in the pure state.

**Toluosalicylol,** $C_7H_5(C_8H_7O)O_2$; toluosalicyl; prepared by heating together equal volumes of salicylol and toluylic, chloride. It crystallizes from alcohol in shining, colorless, easily fusible prisms, insoluble in cold, slightly soluble in hot water, more easily in hot alcohol and in ether.

**Toluoxyl,** $C_8H_7O$; the hypothetical radical of toluic acid and its derivatives.

**Toluric Acid,** $C_2H_2O_2(NH_2)C_8H_7O$; an acid homologous with hippuric, and obtained by the passage of toluic acid through the animal body. Toluic acid is swallowed in doses of several grammes, and the urine voided evaporated to a syrup and exhausted with alcohol. The solution is mixed with oxalic acid, evaporated, and then exhausted with alcohol ether. The acid obtained is purified by recrystallization of its calcium salt. Toluric acid crystallizes from alcohol in trimetric prisms. It is inodorous, melts at 160°, dissolves easily in boiling water and alcohol, and only sparingly in pure ether. It forms crystalline salts with the alkaline earths and metals, most of which are soluble in water.

**Toluyl,** $C_8H_9$; the radical of toluylic alcohol and its allied compounds; free toluyl $\left\{\begin{matrix}C_8H_9\\C_8H_9\end{matrix}\right.$ obtained by the action of sodium on toluylic chloride, is a thick liquid, boiling at 296°.

**Toluylene,** a name sometimes applied to benzylene $C_7H_6$, and stilbene $\left\{\begin{matrix}C_7H_6\\C_7H_6\end{matrix}\right.$, but more properly belonging to the hydrocarbon $C_8H_8$.

**Toluylic Alcohol,** $C_8H_{10}O = C_6H_4 < \begin{matrix}CH_3\\CH_2HO\end{matrix}$; **xylylic alcohol.** The para-compound, the only one known, is obtained from the corresponding aldehyde by the action of nascent hydrogen. It crystallizes in needles, dissolves sparingly in water, melts at 59°, and boils at 217°. Its acetic ether boils at 243°. The above alcohol has also been inappropriately termed tolyl alcohol, but the true tolyl alcohol is cresol, $C_6H_4 < \begin{matrix}CH_3.\\HO\end{matrix}$

**Tolyl Thiosinamine,** a crystalline mass obtained by heating to 100° a mixture of toluidine and oil of mustard. It is inodorous, insoluble in water, soluble in alcohol and ether, and melts at 100°.

**Tolylacetamide,** $C_9H_{11}NO = C_7H_6(C_2H_3O)H_2N$; produced by distilling equivalent weights of toluidine and acetic acid, and treating the last portion of the distillate with acidulated water. It is obtained by slow crystallization in long, thick needles, tasteless, inodorous, melting at 145°, and boiling at 310°. Is sparingly soluble in cold water, easily in alcohol and ether.

**Tolylaniline,** $C_6H_4(C_7H_7)NH_2$; tolylphenylamine; a base isomeric, if not identical with phenyl-toluidine, obtained by heating hydrochlorate of toluidine and aniline. It is separated from other bases formed at the same time by fractional distillation. Boils at about 330°.

**Tolylbenzamide,** $C_7H_6(C_7H_5O)NH_2$; prepared by treating chloride of benzoyl with toluidine, washing the resulting mass with acidulated water, and dissolving in boiling alcohol. It crystallizes therefrom in long, colorless, inodorous needles, insoluble in water, and easily soluble in alcohol and ether; melts at 100°, and volatilizes at 232°.

**Tolylcarbamide,** $CO(C_7H_7)H_3N_2$; benzyl urea; obtained on mixing a hot solution of toluidine sulphate with a solution of potassium cyanate. It separates in white needles, which have a sweetish taste, dissolves sparingly in cold, easily in hot water, in alcohol, and ether.

**Tolylene Chloride,** $C_6H_4(CH_2Cl)_2$; xylylic chloride; obtained by the action of chlorine on paraxylene. It crystallizes in colorless laminæ, boils at 240°, and melts at 100°.

**Tolylene Diamine,** $(C_7H_6)H_4N_2$; a base prepared by distilling dinitrotoluene with iron filings and acetic acid. It forms needle crystals, which melt at 99° and dissolve in boiling water, in alcohol, and in ether.

**Tolylene Glycol,** $C_{14}H_{14}O_2 = \left.\begin{matrix} C_6H_5CHHO \\ C_6H_5CHHO \end{matrix}\right\}$; a diatomic alcohol formed by the action of zinc and hydrochloric acid on benzaldehyde. It crystallizes in large rhombic plates, melting at 132.5°, and sublimes with decomposition. It is sparingly soluble in water, easily in alcohol.

**Tolylsalicylamide,** $C_{14}H_{13}NO(?)$; Jaillard's name for a compound obtained by heating to 50° a mixture of toluidine and salicylol. It forms yellow, inodorous crystals, insoluble in water, soluble in alcohol and ether, and melts at 100°, volatilizing at a higher temperature.

**Tolylsuccinimide,** $C_{11}H_{11}NO_2 = C_7H_5(C_4H_4O_2)''\cdot NH_2$; a compound formed by heating a mixture of succinic acid and toluidine, and crystallizing the cooled mass from boiling water. It is soluble in hot water, in alcohol, and ether, and volatilizes without decomposition.

**Tom,** a river in Siberia, which unites with the Obi near Tomsk; length about 450 miles.

**Tom,** popularly known as Blind Tom, an American musician; born of negro slave parents, near Columbus, Ga., May 25, 1849. He was blind from his birth, and the only sign of intelligence he gave during infancy was an interest in music. When he was four years old he was found one night reproducing on the piano pieces which the young ladies in his master's house had been playing during the day. There is no other instance in musical history, where one so young as Blind Tom was has shown so great an attainment in the power of reproduction and phonetics. Tom made his first appearance in New York, Jan. 15, 1861, and afterward traveled extensively in the United States and Europe, performing astonishing feats on the piano. He died June 13, 1908.

**Tom, Mount,** a mountain in Hampshire co., Mass., near Northampton, on the Connecticut river, opposite Mount Holyoke; is about 1,335 feet high.

**Tomahawk,** an Indian hatchet or ax used in war and in the chase, not only in hand-to-hand combats, but also by being thrown to a considerable distance so as to strike the object with the sharp edge. The native tomahawks have heads of stone attached by thongs, etc., but steel tomahawks are supplied to the Indians by the governments and traders with whom they deal, and a pipe is usually attached to the poll. A hole is drilled through the bottom of the bowl and the poll of the ax, to meet one passing through the length of the handle. As a nautical term, a poleax. To bury the tomahawk, means to make peace; it being the custom of the Indians to bury the tomahawk during the time of peace; so, to dig up the tomahawk means to go to war, to fall into dispute.

**Tomales** (-mä'les) **Bay,** an arm of the Pacific, on the coast of California, 35 miles N. W. of San Francisco.

**Toman,** or **Tomaun,** a Persian gold coin, varying in value according to the locality and the temporary necessities of the government, but generally taken as equal to about $2.25. It is divided into 100 schakis or shakis.

**Tomasini, Jacopo Filippo** (tō-mä-sē'-nē), an Italian writer; born in Padua, Italy, in 1597. He was Bishop of Citta Nuova, in Istria. He wrote: "Lives of Illustrious Men, with Portraits" (1630); "Petrarch Come to Life Again" (1635), a work of curious interest; "On Votive Offerings" (1629). He died in Citta Nuova, in 1654.

**Tomato,** or **Love Apple** (*Lycopersicum esculentum*), a plant of the natural order *Solanaceæ*, so named by Tournefort, but subsequently combined by Linnæus with the genus *Solanum*, now, however, recognized as a distinct genus under the name of the earlier botanist. It is distinguished from *Solanum* by the stamens having the anthers connected by a thin membrane, and by their cells opening in longitudinal slits on the sides, not in pores at the apex as in that genus. The fruit is fleshy, usually red or yellow, divided into two, three, or more cells containing numerous seeds imbedded in pulp. The tomato is one of a genus of several species, all natives of South America, chiefly on the Peruvian side. It is the only species in cultivation in Europe, into which it was brought by the Spaniards in 1583. In the warmer countries of Europe, the United States and other countries in which the summer is warm and prolonged, it has long been cultivated for the excellent qualities of the fruit as an article of diet. Though belonging to a natural order of plants usually regarded with suspicion on account of the powerfully poisonous properties of many of the species comprised in it, it is now recognized as one of the most important and valuable of vegetables grown for human food.

Though it was introduced into Great Britain as early as 1596, the consumption of its fruit there is still small as compared with some other European countries and

America, but it has increased immensely since 1880. The annual supply produced in Great Britain is quite inadequate to meet the demand, which is yearly increasing as the agreeable qualities of the fruit become more widely known; consequently enormous quantities of it are imported, packed dry and in tins, the latter being chiefly used in making soups and sauces. The imported fruit, having to be packed in an imperfectly ripe state in order to reach its destination in safety, is inferior to that grown in Great Britain in color, flavor, and texture; the latter, therefore, commands the highest price in the market. On this account the culture of the tomato has of late years developed into a distinct horticultural industry, like grape growing and mushroom growing. Very extensive establishments in glass have been erected at Worthing in Sussex and at other places in England and in Scotland exclusively for its culture, which proves a remunerative enterprise.

The plant is annual in duration, and too tender to be grown successfully in the open

LARGE EARLY RED TOMATO.
a, fruit of do.; b, fruit of common tomato.

air in Great Britain, except it is reared in heat and grown in pots to the flowering stage under glass before the beginning of June, the earliest period at which it may be safely turned out of doors. Even then it must be planted against a wall with a warm exposure and well sheltered. The seeds are sown in February and March in a temperature of 55° to 65°. An open friable soil is essential, and the use of potash as a manure is hardly less so. The details of management cannot be entered into here. Like its near relative the potato, the tomato is subject to attacks of phytophthora — the potato-disease fungus, and the fruit is liable to a disease also of fungus origin, which causes considerable loss to inexperienced growers, but rarely attack the plants of those who understand their treatment under glass.

The fruit is cooked in a great variety of ways; broiled or fried by itself, or with meat or other accompaniments; made into soups and sauces; sliced raw, it is an excellent ingredient in salads, and eaten with vinegar and pepper and salt uncooked it is perhaps as wholesome and refreshing as in any other way. Its use in any way as food is considered beneficial in affections of the liver, indigestion, and diarrhœa. The word tomato is derived from the Spanish-American name *tamate,* and the English name love apple has arisen from its supposed aphrodisiac properties.

**Tomb,** a monument erected over a grave, in order to mark the resting place, and preserve the memory, of the deceased. In early ages, and among Eastern nations, it sometimes became the practice to place the remains of the dead in excavated sepulchers, whose interior was often decorated with painting or otherwise. Where the usage was to burn the dead their bones and ashes were placed in urns in these receptacles. Some of the most remarkable rock tombs were those of Egypt. The rock tombs of Persia and Lycia have imposing architectural façades.

Tombs in more modern times have generally been mounds or masses of building raised over the remains of the dead. In the Homeric poems heaps or cairns of stones are placed as honorary memorials above the graves of departed heroes. The tumulus of rude ages (see BARROW: CAIRN) is found over the greater part of Northern Europe and is probably older than the subterranean tomb. The pyramids were the sepulchers of the Egyptian monarchs from the 4th to the 12th dynasty. The tombs of Greece, and still more those of the Greek colonies in Asia Minor, were sometimes pillars, or upright stone tablets, sometimes small buildings in the form of temples; the most celebrated was the MAUSOLEUM (*q. v.*). The Roman tombs were not infrequently important architectural structures, varying in form, but oftenest consisting of a circular tower resting on a square basement; familiar examples being the tomb of Cæcilia Metella, and the yet larger and more solid tomb of Hadrian, on the banks of the Tiber, best known as the castle of S. Angelo, which is about 220 feet in height, and of immense solidity. The tombs were generally erected outside the towns, and along the principal roads leading into the country, as in the Via Appia at Rome, and the Street of Tombs at Pompeii. A form of excavated tomb, without external architecture, called COLUMBARIUM (*q. v.*), was also in use in Rome, whose walls were pierced with cells to receive cinerary urns. The prevalent circular tomb became in the later period of the Roman empire polygonal. In many parts of Italy, and in such Spanish-American towns as Lima and Quito, the cemeteries contain rows of niches rising above one an-

other in terraces, honeycomb-like, and each holding a coffin, which rests there so long as the heirs pay the rent.

In the earlier centuries of Christianity the burial of the dead in churches was prohibited. The first step which led to its adoption was the custom of erecting churches over the graves of martyrs; then followed the permission to kings and emperors to be buried in the church porch. The most important tombs of the Middle Ages are generally within churches or cloisters. The earlier examples consist of a simple stone coffin, or sarcophagus, often with a low gabled lid and a sculptured cross. An altar tomb, or tomb in the form of a table, followed; and in the 13th century a species of tomb was introduced, consisting of a sarcophagus, on which rests a recumbent figure of the deceased, the whole being surmounted by a canopy, often of exquisite symmetry and richness. The tombs of the Scaligers at Verona, with their beautiful wrought-iron railing, are famous. In the renaissance period of art the tombs became more and more complex. The sarcophagus was disguised, or made the least important part of the monument; the representation of the deceased was confined to a medallion likeness, and the most prominent part of the tomb was composed of sculptured upholstery, and groups of symbolical and eventually mythological figures. In some of the 16th-century examples, as Michael Angelo's tombs of Giuliano and Lorenzo di Medici, at Florence, the inappropriateness of the design is partly redeemed by the beauty of the figures; but in the succeeding centuries the vicious taste of these monuments rapidly increased, till it culminated in some of the hideous tombs that disfigure Westminster Abbey and St. Paul's.

**Tombac,** or **Tombak,** an alloy consisting of from about 75 to 85 parts copper, mixed with 25 to 15 parts zinc, and used as an imitation of gold for cheap jewelry. When arsenic is added it forms white tombac.

**Tomb Bat,** in zoölogy, the *Taphozous perforatus;* is about three inches long, exclusive of the tail; body covered with short dark brown fur; which extends over the basis of the wings, and down the interfemoral membrane as far as the point where the tail emerges therefrom. It was discovered by Geoffroy in the chambers of the pyramids, and in other tombs in Egypt, and is said to inhabit Sennaar and Senegal. It passes the day in the darkest places it can find, coming out at dusk, and feeding exclusively on insects.

**Tombigbee,** a river which rises in Tishomingo co., Miss., and after an irregular course of 450 miles, joins the Alabama river 45 miles above Mobile; the united stream is called Mobile river below the junction. It is navigable for 410 miles from Mobile Bay.

**Tombs, The,** a noted prison in New York city. It occupies the whole of the block bounded by Centre, Leonard, Elm, and Franklin streets, and is connected by "the Bridge of Sighs" with the criminal-law courts on the opposite side of Franklin street.

**Tom Cod,** or **Frost Fish,** a species of cod (*Morrhua pruinosa*) of the North Atlantic, usually abundant in the mouths of the rivers after the first frosts of autumn. It is from 4 to 12 inches long, olive-green above, and silvery below.

**Tome, Jacob,** an American philanthropist; born in Manheim township, York co., Pa., Aug. 13, 1810; went to Port Deposit, Md., in 1833, and there began operations in lumber and grain which yielded him vast wealth. In 1864, as chairman of the Finance Committee of the Maryland Senate, he relived the seemingly hopeless financial condition of the State and reduced its indebtedness to less than $1,000,000. In 1884, he presented to Dickinson College, of which he was a trustee, a valuable building for scientific uses. His largest gift was for the foundation of the Jacob Tome Institute, at Port Deposit, $1,600,000, a sum that was increased by his will to more than $3,500,000. He died in Port Deposit, Md., March 16, 1898.

**Tomes, Robert,** an American physician and author; born in New York city, March 27, 1817. Besides many contributions to journals and periodicals, he published: "The Bourbon Prince" (1853); "Richard the Lion-Hearted" (1853); "Oliver Cromwell" (1855); "Panama in 1855" (1855); "The Americans in Japan" (1857); "The Battles of America by Sea and Land" (3 vols. 1861); "The Champagne Country" (1867); and "The War with the South" (3 vols. 1864–1867). He died in Brooklyn, N. Y., Aug. 28, 1882.

**Tomlinson, Everett Titsworth,** an American author; born in Shiloh, N. J., May 23, 1859; was educated at Williams College; was for a time head master of Rutgers College Preparatory Department; ordained in the Baptist Church and accepted a charge in Elizabeth, N. J. He published numerous juvenile stories, including: "The Search for Andrew Field" (1894); "The Boy Soldiers of 1812" (1895); "The Colonial Boys" (1895); "The Boy Officers of 1812" (1896); "Three Young Continentals" (1896); "Tecumseh's Young Braves" (1897); "Washington's Young Aide" (1897); "Boys with Old Hickory" (1898); "Boys of Old Monmouth" (1898); "Camping on the St. Lawrence" (1899); "In the Hands of the Redcoats" (1901); "The House Boat on the St. Lawrence" (1901); etc.

**Tommy Atkins,** a name given to the privates of the British army. It is said to have

originated in the custom of making out blanks for military accounts with the name, "I, Tommy Atkins," etc. Kipling has immortalized it in verse.

**Tompa, Michael** (tōm′pä), a Hungarian poet; born in Rimaszombat, Gömör, Hungary, Sept. 29, 1819. He wrote: "Folk Tales and Popular Sayings" (1846); several allegorical poems, among them "The Stork" (1847), expressing the popular sympathy with the coming revolution; "Stories of the Flowers" (1854). He died July 30, 1868.

**Tompkins, Charles H.,** an American military officer; born in Fort Monroe, Va., Sept. 12, 1830; studied at the United States Military Academy; began his active military career in 1856, when he enlisted in the dragoons and served for three years on the frontier. He was promoted 1st lieutenant in the 2d United States Cavalry in April, 1861. During his service in the defense of Washington he distinguished himself on the night of May 31, 1861, by making one of the first cavalry reconnoissances of the war. At the head of the 5th Cavalry he charged through Fairfax Court House, Va., three times and captured two outposts. Later, he served on the staff of Gen. George Stoneman. During the Shenandoah campaign he won distinction under Generals Banks and Pope. In recognition of his gallantry during the war he was brevetted Brigadier-General in March, 1865. He was chief quartermaster of the principal divisions of the army in 1865–1888; was then made chief quartermaster of the Division of the Atlantic; and was retired with the rank of colonel, Sept. 12, 1894.

**Tompkins, Daniel D.,** an American statesman; born in Fox Meadows, Westchester co., N. Y., June 21, 1774; was graduated at Columbia College in 1795 and admitted to the New York bar in 1796. He was a member of the legislature and the State Constitutional Convention in 1801; member of Congress in 1804–1807, when he resigned to become Judge of the Supreme Court of New York. He was governor in 1807–1817, and Vice-President of the United States in 1817–1825. He was a delegate to the State Constitutional Convention of 1821, contributed money and troops to the national government in the War of 1812, during which he commanded the 3d Military District; and in a message to the New York legislature in 1817, recommended the total abolition of slavery in that State, an act which brought about the passage of the bill against slavery which took effect on July 4, 1827. He died in Staten Island, N. Y., June 11, 1825.

**Tompkins, Fort,** a defensive work on Staten Island, at the entrance of New York harbor, and opposite Fort Hamilton.

**Tomsk,** a town of Western Siberia, on the Tom; 2,809 miles E. of St. Petersburg. Situated on the great trade route from Tiumen to Irkutsk, and near the main line of the Siberian railway, it has long been the seat of an important transit trade. Leather and carriages are manufactured; and a university was established in 1888. Great part of the town was burned in 1890. Pop. (1897) 52,430. The province of Tomsk, extending to the Chinese frontier, has an area of 331,159 square miles, more than 2½ times the size of Great Britain and Ireland, and a population (1897) of 1,929,092.

**Tomson, Graham R.** See Watson, Rosamund Marriott.

**Ton,** a denomination of weight equivalent to 20 hundredweights, or 2,240 pounds. In the United States goods are sometimes weighed by the short ton, of 2,000 pounds, the hundredweight being reckoned at 100 pounds, but it is decided by Act of Congress that, unless otherwise specified, a ton weight is to be understood as 2,240 pounds avoirdupois.

**Tonality,** in music: (1) Correctness of pitch; as when a singer or violinist is said to exhibit correct or doubtful tonality; signifying the production of sounds in tune or out of tune. (2) Quality of tone, intonation, as when a singer or violinist is said to possess pure tonality, that is, to produce a pure quality of tone. (3) Key-relationship; as when a melody or passage in harmony is said to be of uncertain tonality, that is, to be wanting in definiteness of key or scale.

**To-name,** a name added to another name; a name given in addition to the Christian and surname of a person to distinguish him from others of the same name; a nickname. Such to-names are frequent where families continually intermarry, and where, consequently, the same name is common to several individuals. To-names are common, especially among the fisher population on the E. coast of Scotland, and in Wales.

**Tonawanda,** a village in Erie co., N. Y.; on Tonawanda creek, the Niagara river, the Erie canal, and the New York Central and Hudson river railroad; 11 miles N. of Buffalo. Here are a union school with library, a weekly newspaper, and National and State banks. It has several manufactories, chiefly of lumber. Pop. (1890) 7,145; (1900) 7,421; (1910) 8,290.

**Tonawanda Creek,** a stream in Western New York, which flows into the Niagara river 10 miles N. of Buffalo; length 75 miles.

**Tone, in** music, the sound produced by the vibration of a string or other sonorous body; a musical sound. Nearly every musical sound is composite, that is, consists of several simultaneous tones having different

rates of vibration according to fixed laws, which depend on the nature of the sonorous body and the mode of producing its vibrations. The simultaneously sounding components are called partial tones; that one having the lowest rate of vibration and the loudest sound is termed the prime, principal, or fundamental tone; the other partial tones are called harmonics or overtones.

**Tone, Theobald Wolfe,** an Irish revolutionist; born in Dublin, Ireland, June 20, 1763; was educated at Trinity College; studied law in London, and was called to the bar at the Middle Temple (1798). He was an ardent sympathizer with the doctrines of the French Revolution, and having promoted the combination of the Irish Catholics and Dissenters, founded the Society of United Irishmen in 1791. The discovery of his secret negotiations with France drove him to the United States (1795). He sailed for France in 1796, and became Brigadier-General in Hoche's projected expedition to Ireland. He served in the Bavarian army in 1797, and in 1798 was captured on board a French squadron bound for Ireland. He was taken to Dublin, and sentenced to death by a court-martial, but committed suicide in prison, Nov. 19, 1798.

**Tone, William Theobald Wolfe,** a French military officer; born in Dublin, Ireland, April 29, 1791; was educated in France; was cadet in the French Imperial School of Cavalry in 1810–1813; promoted lieutenant in the same year; won distinction at the battle of Leipsic, where he received six wounds. After the fall of Napoleon, he settled in the United States and devoted himself to literary work. His publications include: "The Civil and Political State of Italy Under the Domination of the Goths" (1813); "School of Cavalry, or a System for Instruction, etc., proposed for the Cavalry of the United States" (1824). He died in New York city, Oct. 10, 1828.

**Tone=Gawa,** the longest river in Japan; navigable for nearly 100 miles for flat-bottomed junks, but the coast is treacherous at its mouth, which is often closed by an impassable bar It empties into the Pacific E. of Tokyo; length, about 170 miles.

**Toner, Joseph Meredith,** an American physician; born in Pittsburg, Pa., April 30, 1825; was graduated at the Vermont Medical College in 1850, and at the Jefferson Medical College in 1853; settled in Washington, D. C., in 1855. He was the originator of the American Medical Association Library, founded in Washington in 1868, and made a part of the Smithsonian Institution. He founded the Toner lectures for the purpose of discovering new facts in medicine in 1871. He also invented the system of symbols of geographical localities which the United States Postoffice Department adopted for its publications. He was the author of "Maternal Instinct" (1864); "Necrological Notices of Deceased Surgeons in the Rebellion" (1870); "Medical Register of the United States" (1874); "Dictionary of Elevations and Climatic Register of the United States" (1874); "Annals of Medical Progress and Medical Education in the United States" (1874); "Medical Men of the Revolution" (1876); etc. In 1882 he presented his library of 26,000 volumes and 18,000 pamphlets to the United States government. He died in Washington, D. C., Aug. 1, 1896.

**Tonga,** or **Friendly Islands,** a group in the S. Pacific Ocean, forming an archipelago of very considerable extent, and consisting of more than 150 islands, the greater part of which are either mere rocks or shoals, or desert spots. Most of them are of coral formation; but some of them are volcanic in their origin, and in Tofua there is an active volcano. The principal member of the group is Tongatuba or Sacred Tonga. The Tonga Islands were discovered by Tasman in 1643, but were named by Captain Cook, from the firm alliance that seemed to subsist among the natives, and from their courteous behavior to strangers. Among the products of the islands are yams, plantains, cocoanuts, hogs, fowls, fish, and all sorts of shell fish. The islands were first visited by missionaries in 1797. In 1827 the Wesleyan Methodists succeeded in the work of evangelization, and their labors were finally crowned with such success that most of the inhabitants are now Christians. Nearly all the islands are under the rule of one Christian chief; but by an agreement made between England, Germany, and the United States in 1899 the islands are under the protectorate of Great Britain. Total area, 374 square miles; pop. (1900) 20,677.

**Tonga Bay,** an inlet on the E. coast of South Africa, near Cape Delgado.

**Tongataboo,** or **Tonga=tabu,** one of the most S. of the Tonga or Friendly Islands, in the Pacific Ocean. It is of coral formation, about 60 miles in circuit. Its soil is extremely fertile.

**Tongres,** an ancient town of Belgium, in the province of Limburg; on the Jaar; 12 miles N. N. W. of Liège. Its church of Notre Dame (1240) was the first dedicated to the Virgin N. of the Alps, and has a cloister of the 10th century, the oldest in the Netherlands. The hot spring in the vicinity was known to the Romans, and its virtues are described by Pliny. Tongres has industries in brewing, tanning, and the making of tiles and chicory.

**Tongrian Beds,** in geology, beds constituting the Lower Oligocene of Belgium, developed around Tongres. They are ma-

rine, and are contemporaneous with the Headon series of England.

**Tongs,** an instrument of metal, consisting of two parts or long legs or shafts, joined at one end, by which tight hold is taken of anything, as of coals in the fire, heated metals, etc.; as, a pair of tongs, a smith's tongs.

**Tongue,** in human anatomy, a muscular organ in the mouth, covered with mucous membrane, the muscular structure rendering it of use in mastication, deglutition, and the articulation of speech, while the mucous membrane, which is endowed with common and tactile sensibility, constitutes it the seat of the sense of taste. The tongue occupies the concavity of the arch of the lower jaw; its basal or hinder part is connected with the hyoid bone, while beneath it is attached by means of the genio-glossus muscle to the lower jaw. The tongue is marked along the middle for nearly its whole length by a slight furrow called the raphe, often terminating behind in a depression called the foramen cœcum, within which mucous glands open. The upper surface of the tongue in front of the foramen is covered with small eminences called papillæ, some circumvallate, others fungiform, and the rest filiform, the last being the most numerous. Behind these are numerous small racemose glands, called lingual glands.

In comparative anatomy, the tongue of the lower mammals is essentially on the same model; that of most birds is small, thin, cartilaginous, or cased in horn, like the mandibles, and is an organ of prehension rather than of taste, there being, however, some exceptions, as the parrots, which have soft and fleshy tongues, which is perhaps the reason why they can imitate the human voice. A horny tongue is a prolongation of the hyoid bone. The tongue of the snakes consists of two muscular cylinders, united at the base, but free toward the tips. Three types of tongue exist among the lizards. In most of the order it is long, protrusible, and forked; in a second division it is thick, fleshy, and not protrusible, and in a third, containing the chameleons, it is long, protrusible, and clavate at the ti In fishes the tongue is often covered with teeth, and is an organ of prehension rather than of taste. There is a distinct tongue constituted by the central part of the lingula in bees. The cephalopods have a muscular tongue, part an organ of taste, and in part developed into a lingual ribbon or odontophore. The gasteropoda in many cases have a tongue, a lingual ribbon, odontophore, or radula. In carpentry: (1) A fin on the edge of a plate or board, adapted to fit into a groove of an adjacent board. Also used in sliding parts of machinery. (2) The tapering, projecting end of a timber, worked down to fay on an edge or scarf to another timber. In music, the vibrating, metallic reed in instruments like the harmonium, concertina, etc. In nautical terms, (1) the upper main piece of a built mast. (2) A rope spliced into the upper part of a standing back-stay. In pathology, the tongue is liable to hemorrhage, hypertrophy, inflammation, abscess, cancer, etc. In a railway, the short movable rail of a switch, by which the wheels are directed to one or the other lines of rail. In vehicles, the single shaft or pole which, in two-horse vehicles, is attached to the fore carriage, and is the means of guiding and drawing.

**Tongues, Confusion of,** the penalty inflicted on the builders of Babel when God so confounded their language that they could not understand each other, though up to that time there had been among them only one language. The result was that the building of the tower was abandoned, and those who had been engaged in its erection were dispersed over various lands (Gen. xi: 1-9).

**Tongues, Gift of,** a gift bestowed in connection with the Pentecostal descent of the Holy Spirit. When the members of the Church had assembled with one accord on the Jewish day of Pentecost, suddenly a mighty, rushing wind entering pervaded the building in which they had assembled, cloven tongues as of fire descended on each, and those on whom they were bestowed began to speak with "other tongues, as the Spirit gave them utterance" — the Parthians, Medes, Elamites, and others, who repaired to the place when news of the miracle reached them, bearing testimony to its reality (Acts ii: 1-21). Three explanations of this mysterious gift have been offered: (1) That on the day of Pentecost the disciples received a supernatural knowledge of all such languages as were needed for their work as evangelists. (2) That the gift consisted in the impression produced on the hearers, and that the words uttered by the disciples in Aramaic were heard by those who listened as in their native speech. (3) That the "tongues" consisted of ecstatic bursts of praise which the disciples might have heard uttered at previous feasts of Pentecost by foreign pilgrims. In this case there would be a supernatural exaltation of memory, not a miraculous knowledge of words never heard before. (4) That they were cries of ecstatic devotion of no definite significance except to those who uttered them.

**Tonic,** or **Keynote,** in music, the first or fundamental note of any scale, the principal sound on which all regular melodies depend, and in which they or their accompanying basses naturally terminate.

**Tonic,** in medicine, any remedy which improves the tone or vigor of the fibers of the stomach and bowels, or of the muscular fibers generally. Tonics may be said to be of two kinds, medical and non-medical.

Medical tonics act chiefly in two ways: (1) Indirectly, by first influencing the stomach and increasing its digestive powers; such being the effect of the vegetable bitters, the most important of which are calumba, chamomile, cinchona bark, gentian, taraxacum, etc. (2) Directly, by passing into and exerting their influence through the blood; such being the case with the various preparations of iron, certain mineral acids, and salts. The non-medical tonics are open-air exercise, friction, cold in its various forms and applications, as the shower bath, sea bathing, etc.

**Tonic Sol=fa,** in music, a system of musical notation by which the staff, clefs, key signatures, and time signatures of music are dispensed with, and the sounds are represented by initial solfeggio letters, placed between upright bars, subdivided as required for the various rhythms. In modern music there is but one diatonic scale, and "key" may be defined as the position of a scale, and "modulation" as the shifting of a scale in pitch. Many attempts have been made from time to time since the 17th century to provide singers with a notation by means of which the diatonic scale could under one form be used for all keys. Miss Glover, of England, suggested the use of a movable *doh,* and the representation of the sounds by initial letters. The late John Curwen devoted his life to the development and propagation of the system and method of teaching it. The scale stands thus (*te* representing the Italian *si*) :

d r m f s l t $d^1$, etc.

By writing at the head, Key C, Key C sharp, Key D flat, etc., the singer finds a true representation of the scale in any key. For example, the tune of "America" may be written in 15 different keys (each with a different signature) on the staff, whereas it can only be written one way in tonic sol-fa, the direction for key being simply written above and altered when required:

d d r $t_1$ d r m m f m r d, etc.

As modulations occur, one note of the old scale is linked to a note of the new scale, thus forming a "bridge" — *e. g.,* to modulate from key C to key G, the s of the old key becomes the d of the new; from key C into key F, the f of the old becomes the d of the new, and so on. The minor scale starts from the note *lah.* The time-notation of the tonic sol-fa goes back also to first principles — *e. g.,* by dividing the upright bars by a colon thus, | : |, any duple time is represented, from two semibreves in a bar to two demi-semiquavers. Similarly, | : : | is all that is required for the triple times, | : | : | for the quadruple times, and so on. It will be at once seen that the "up and down" of pitch is not represented to the eye as on the staff; but on the other hand, tonic sol-fa signs display the relationship of every note to the scale from which it is taken; this is not necessarily expressed on the staff. The value of tonic sol-fa as a basis of musical education is not generally acknowledged. Particularly in the United States it is objected that it does not, like the common notation, indicate pitch directly to the eye; that its applicability to instrumental music is limited; and that its acquirement is not like that of the ordinary notation, an introduction to the general wealth of musical literature.

**Tonicity,** in physiology, that property of the muscles by which they preserve a certain degree of firmness and slight contraction, best seen in the sphincters. Tonicity appears to be under the influence of the nervous system, since it is lost as soon as the nerve distributed to a muscle is divided, the muscle immediately becoming flaccid and relaxed.

**Toning,** in photography, the treatment of a positive photographic print with a weak solution of gold, in conjunction with other modifying chemical salts, by which the whole or a portion of the deposit of metallic sllver is replaced by metallic gold in fine division. The effect is to give permanency to the print, subduing and modifying the disagreeable color, and substituting various shades of purple, black, blue, brown, and gray.

**Tonka Bean,** in botany, the *Dipterix odorata,* called also *Coumarouna odorata* It is a tree from Guiana, much branched at the top, with large, alternate, pinnate leaves, racemes of flowers, and almond-like legumes. The kernels are very fragrant, and used in the manufacture of snuff, and are put into chests to communicate a pleasant odor to the clothes and to drive away insects. They are sold in America under the corrupted name of Tonking beans, as if they came from Tonking.

**Tonking,** or **Tonquin,** since 1884 a French possession, is the N. E. portion of the Indo-Chinese peninsula, bordering on China; area, est. 46,000 square miles; pop. 10,000,000. The name has been used for various areas in this region. The main feature of the country is the Sang-koi or Red river (variously spelt Sang-koi, Sang-coi, etc), coming from Yunnan, and traversing the whole of Tonking lengthwise. The capital is Hanoi. The chief produce is rice, silk, sugar, pepper, oil, cotton, tobacco, and fruits, with some copper and iron; and companies are now working coal and antimony mines at one or two places on the coast, especially near the chief port of Haiphong. The imports in 1898 had a value of $8,735,000, the exports of $3,285,000. The French scheme of tapping the resources of Yunnan

by means of the Song-koi has proved impracticable, the navigation of the upper course being very difficult.

**Tonnage,** in regard to ships, a measure both of cubical capacity and of dead-weight carrying capability. The term, used by itself, may have reference severally to "builders' old measurement" tonnage (B. O. M.), "register" tonnage, "displacement" tonnage, "freight" tonnage, etc., each of which expressions is more or less current in shipping circles. From very early times in the history of shipping a scale of one sort or other must have been employed to determine the relative capacity or carrying power of different vessels, and in point of fact the term "tonnage" in this connection can be traced back for at least 500 years. In Great Britain the first Act of Parliament dealing with the subject was passed in 1422, a second was introduced in 1694, and a third in 1720, but the application of these was limited to particular classes of ships, or those employed in particular trades.

The first legal system of measurement having general application to all classes of merchant ships was introduced in 1773, and is known as "builders' old measurement." Long before its legal enforcement, however, it, or a similar rule, had become the established practise of British shipbuilders, though not applied in an exactly uniform manner by different builders. Shortly stated, the rule was to multiply the length (minus three-fifths of the breadth) by the breadth, the product by half the breadth, and to divide by 94, the quotient expressing the tonnage. During the long period prior to the 19th century, when naval architecture made little progress, and types of ships and methods of construction were almost stereotyped, this system seems to have quite answered its original purpose — *i. e.*, that of roughly expressing the "dead-weight" carrying power of ships. But with the growth of shipping, and with the legal assessment of dues according to the tonnage as computed by this system, various methods of evasion were resorted to, the effects of which were most hurtful to true progress in ship architecture. The rule only concerned itself with length and breadth, and took no account of actual form or of depth, but assumed the depth to be equal to half the breadth. Builders had simply to increase the depth, leaving the length and breadth unchanged, or to make the form "fuller," in order to increase the carrying power without in any way increasing the legal and taxable tonnage. Ships were in consequence built with little beam and of such excessive depth as to render them unsafe and unseaworthy. The inadequacy and perniciousness of this system of measurement were only slowly recognized, and it remained in force until 1836, when a "new measurement" law was substituted. For purposes of convenience, however, it continued to be used by builders in estimates as to cost and comparison of shipping, and even yet it is sometimes to be met with in builders' statements.

The "new measurement" gave place in 1854 to "register" tonnage, a system resembling it in principle, but much more perfect in its details, and which, with minor modifications, is still in force as the legal basis of measurement upon which dock, harbor, light, and other dues are assessed. It determines, in an accurate and easy manner, the entire internal capacity in cubic feet of a ship below the "tonnage deck." At suitably placed and equi-distant stations throughout the length of ship measurements are taken of the vertical transverse area of the hold, and these areas are used, in conjunction with the length of ship, in obtaining the volume of hold space. If a vessel's hull is continued unbroken to support a deck above the tonnage deck, the volume of the space between the deck is separately estimated, and all closed-in spaces above the upper deck, such as poop, forecastle, deck houses, etc., intended for accommodation or stowage, are also calculated. The sum of all these volumes in cubic feet, divided by 100, gives the "gross register" tonnage. A "register" ton, therefore, is simply 100 cubic feet of space, and has only very indirect relation to a "dead-weight" of 20 hundredweight avoirdupois. What is known as "net register" tonnage — and actually forms the tonnage inscribed in the register of British shipping — is the figure remaining after certain deductions are made from the gross. It is intended to represent the space actually available in a ship for remunerative service, such as the stowage of cargo or the accommodation of passengers. In sailing vessels the deduction is very small indeed, representing the space occupied by the crew, and usually only from 4 to 5 per cent. of the gross. In steamers the case is very different, for not only the crew-space, but that occupied by the engines, boilers, coals, etc., is deducted. Details as to the method of computing these deductions cannot be given here, but it may be stated generally that for the majority of ocean-going steamers the net tonnage is reduced from the gross by as much as about 35 per cent. The question of deductions has all along presented many difficulties and anomalies, and in some cases the original law has had to be amended to obviate these. On the whole, however, the principle on which the present system of tonnage measurement is based has served the purpose admirably — certainly in a way much superior to any previous system — and during the years it has been in vogue comparatively few changes have had to be made, while, on the other hand, it has been adopt-

ed by all the principal maritime nations and by various international commissions. Alternative systems of tonnage measurements have been advocated from time to time when existing inequalities have been found to press specially hard, but none have found entire favor. One is the substitution of a dead-weight basis of measurement, on the grounds that internal capacity in the present conditions of the shipping trade is not the fair measure of the possible earnings of ships under most circumstances, while dead-weight capability is, and that such a mode of measurement would obviate all disputes and difficulties as to deductions and allowances. Both this proposal and a somewhat similar one, based on a vessel's "displacement"—*i. e.*, the total weight of a ship in tons when immersed to her maximum draught or load line — have the great disadvantage of necessitating the fixing of an equitable maximum load line for the various classes of vessels, and for the vessels of the several maritime nations. The fixing of a universal load line in the case of cargo vessels is a problem fraught with almost insuperable difficulty, though a partial solution has been attained in connection with certain types of British merchant ships.

"Displacement" tonnage is by general consent regarded as the fairest measure for the tonnage of naval ships, since they are designed to carry certain maximum weights and to float at certain load lines which are fixed with reference to the character of service. It has for many years been the official tonnage for the warships of France and other European nations, and since 1872 — prior to which date the B. O. M. rule was the only one employed — the tonnage of British naval ships has been based on the displacement principle. The United States navy has also adopted displacement tonnage; in fact, it is all but universally employed.

"Freight" tonnage, a system of measurement commonly employed in connection with stowage by merchants and shipowners, although it has no legal authority, is simply a measure of cubical capacity. A freight ton, or "unit of measurement cargo," simply means 40 cubic feet of space available for cargo, and is therefore two-fifths of a register ton. It is a purely arbitrary measure, based on the assumption that 40 cubic feet are required to stow a ton weight, but for some kinds of cargo of a lighter nature 45 and even 50 cubic feet form the unit of measurement.

In connection with yachts tonnage is measured by special rules for the purpose of regulating time allowances in racing. These rules are numerous and varied almost as the yacht clubs and associations employing them, but the rule which has hitherto been most generally adopted in Great Britain is known as the "Thames Rule," and is simply a slight modification from the B. O. M. tonnage.

**Tonnage, and Poundage,** certain duties on wine and other merchandise, which began to be levied in England in the reign of Edward II. They were at first granted to the crown by the vote of Parliament for a limited number of years, and renewed on their expiry. The object of these imposts was said to be that the king might have ready mony in case of a sudden emergency demanding it for the defense of the realm and the guarding of the sea. Originally fluctuating in amount, tonnage (more correctly tunnage) and poundage came to be fixed at 3s. on every tun of wine, and 5 per cent. on all goods imported. In the reign of Henry V. they were first conferred on the king for life; and the same course being followed with his successors, the sovereign began gradually to consider them as his proper right and inheritance, and the vote of Parliament as but a formality expressive of the popular recognition of his prerogative. Though these duties were not voted to Henry VIII. till the 6th year of his reign, he, notwithstanding, levied them from the date of his accession. It was, in fact, usual to levy these duties during the period intervening between a sovereign's accession and his first Parliament, and this was done by Charles I., as by his predecessors. The commons, however, in Charles's first Parliament accorded these imposts not for life, but for a year only; and the House of Lords objecting to this departure from previous usages, and rejecting the bill, it was attempted to levy tonnage and poundage by the royal authority alone, a proceeding which repeatedly aroused the opposition of the Commons. Charles was in 1641 induced to renounce the power of levying these or any other imposts without parliamentary sanction. Charles II. and James II. obtained grants of tonnage and poundage for life, but William III. only for limited periods; and by three statutes of Anne and George I. these imposts were made perpetual, and mortgaged for the public debt. The Customs Consolidation Act in 1787 swept away tonnage and poundage, and similar charges, and substituted a new and single duty on each article.

**Tonometer,** an instrument invented in 1834 by Scheibler and improved by König, for determining the exact number of vibrations per second which produce a given tone, and for tuning musical instruments.

**Tonsilitis,** inflammation of one or both of the tonsils, generally extending also to the palate and uvula. It brings with it dryness, pain, and heat of the throat, with difficulty of swallowing, and often ends in abscesses, one at least of which suppurates. It is a common disease in moist variable weather.

**Tonsils,** in anatomy, two glands, one on each side of the palate between its pillars. They consist of a number of deep mucous follicles or cryptæ, surrounded by and deposited in cellular tissue arranged in a somewhat circular form. They are sometimes called amygdalæ. The chief diseases which affect the tonsils are inflammation and hypertrophy of their substance, or the morbid influence may be specially concentrated on the follicles alone.

**Tonson, Jacob,** an English publisher; born in London, England, in 1656. He commenced business in Chancery Lane in 1677, removed to Gray's Inn in 1697, and thence in 1712 to the Shakespeare's Head, opposite Catherine Street in the Strand. He retired from business in 1720, and died March 18, 1736. He is worthy of remembrance as Dryden's regular publisher, as the originator of the miscellanies which bear his name, as having brought out the first good editions of Milton and the first complete octavo edition of Shakespeare, and as the secretary of the Kit Cat Club, which used to meet in his villa at Barn Elms on the Thames.

**Tonsure,** in ecclesiology and Church history, the shaving of the crown in a circle, which is a distinguishing mark of clerics in the Roman Church. Most of the mendicant and cloistered orders allow only a narrow strip of hair to grow round the head, all above and below being shaved; the tonsure of secular clerics is small. The tonsure is a necessary preliminary to entering the clerical state, whether secular or religious; in the former case it is conferred by the bishop of the diocese, in the latter by the head of the religious house, if a mitered abbot. It invests the receiver with all the privileges of a cleric, and furnishes a means to distinguish the higher from the lower clergy, as the extent of the tonsure increases with the rank till the priesthood is reached. Writers of the 7th and 8th centuries distinguish three kinds of tonsure: (1) The Roman, or St. Peter's, in which only a circle of hair was left, common in France and Spain. (2) St. Paul's which was entire, usual in the Eastern Church. (3) The Celtic, or St. John's, adopted by the British and Irish Churches, in which the head was shaved in front of a line drawn from ear to ear. A violent controversy arose in the 7th century as to the comparative merits of the Celtic and Roman tonsures, but was eventually decided in favor of the latter, though its introduction nearly led to a schism. Also, the act of admission to the clerical state. At first it was never given without some minor order being conferred at the same time, but this practice ceased in the 7th century.

**Tontine,** a term derived from the name of Lorenzo Tonti, a Neapolitan, who settled in Paris in Cardinal Mazarin's time, and proposed in 1653 to raise a fund of $125,000,000 for the relief of the national exchequer by means of a financial association, of which the great prize should ultimately accrue to the longest liver. There were to be shares of $1,500. The subscribers were to be divided into 10 classes according to age; and for each class a fixed sum was annually to be divided equally among the members of the class. In this way, while each member should get fair interest from the first on his capital, the profit falling to survivors would increase as years went on, and the last survivor would receive the whole of the interest due to the class he belonged to. Mazarin and Tonti were both Italians, and regarded in Paris with suspicion, and, in spite of the cardinal's support, the scheme fell through. Tonti for a time received a pension, and was an active promoter of companies; but was ultimately committed to the Bastille, whence he for some years corresponded with his friends. There he seems to have died. But in 1689–1692 Louis XIV., sorely in need of money, reverted to the plan of the Italian adventurer, and raised a sum of $70,000,000 by a tontine of 40 years' duration. The sole survivor was in 1726 drawing an annuity of $367,500 on his original share of $1,500. The tontine is a lottery of annuities — or compound of lottery and annuity — and was frequently had recourse to in France in the 18th century, with government sanction. Generally, in an association on what is called the tontine principle, a payment is made by each member of the association, and with the capital so formed an annuity, payable at the same rate till all the lives forming the association are extinct, is bought from some company or individual. This annuity is divided among the members according to age and premium paid by each; and on the decease of any member the surplus thence arising is divided among the survivors, and on the death of the last member of the association the total annuity reverts to the source from which it has hitherto emanated. There are various kinds of tontines; and the designation of tontine may, with propriety, be applied to any financial scheme by which it is proposed that gain shall accrue to survivorship.

In Great Britain tontines have been less popular than in France, but both in England and Ireland these were often established. Three Irish tontines in 1773–1777 had 3,500 members. The last public one in England was in 1789. In Great Britain they were chiefly set on foot not for purposes of public finance, but to enable a number of small capitalists to build hotels and the like, requiring sums beyond what any one of them singly could raise. In 1871 it was proposed to organize a tontine to take over the Alexandra Park and Palace, but the scheme

came to nothing. The United States has had its tontines also: the New York Tontine Association, founded in 1790, was wound up in the years 1870-1878, but other American tontine institutions have been established.

**Tooke, John Horne,** an English political writer; born in Westminster, England, June 25, 1736; was educated at Westminster and Eton; afterward going to St. John's College, Cambridge. In 1760 he entered the Church, and obtained the living of New Brentford. The year 1771 witnessed his contest with Junius, in which, in the general opinion, he came off victor. In 1773 he resigned his benefice to study for the bar (to which from being in orders he was not admitted); and by his legal advice to Mr. Tooke of Purley, he became that gentleman's heir, and assumed his name. In 1777 he was prosecuted for a seditious libel condemning the American war, and his trial resulted in a year's imprisonment, and a fine of $1,000. He was a short time member of Parliament for Old Sarum. He wrote several political pamphlets and an ingenious linguistic work entitled "Epea Pteroenta, or the Diversions of Purley." He died in Wimbledon, England, March 18, 1812.

**Tool,** an instrument of manual operation, particularly such as are used by artisans, mechanics, craftsmen, etc.; an implement of labor, as a hammer, saw, plane, chisel, and the like; also, a cutter or other part of an instrument or machine that dresses or finishes off work; as, a set of carpenter's tools, a planing tool, etc. Hence, any instrument of use or service; especially, a pistol employed in duelling: as, each second carried the respective tools. Also, a person employed as an instrument or agent by another person; used in an ill sense; as, he found him to be the most suitable tool for the purpose.

**Toole, John Laurence,** an English comedian; born in London, March 12, 1831. His father was well known in the city as civic toastmaster. While a clerk in a wine merchant's office, he devoted his leisure to private theatricals with a success which induced him to take to the stage as a profession. Charles Dickens was among the first to recognize the talents of the clever young amateur, whose dramatic genius so closely resembled his own in its bent. Toole made his first public appearance at the Haymarket Theater on July 22, 1852, on the occasion of a benefit to Mr. Webster. After a thorough training in Dublin, Edinburgh, Glasgow, and other leading provincial theaters, he was engaged at St. James' Theater in 1854. Thence he passed to the Lyceum, and an engagement of several years as leading comedian at the New Adelphi followed, where he was closely associated with Paul Bedford. He made a professional tour in the United States in 1875, and in Australia in 1891, and with these exceptions he appeared regularly in every season in London for many years, latterly in a theater under his own management. His strength lay in broad and even farcical humor, but he never failed to "hold the mirror up to nature," and his very caricatures were always intelligible and consistent. In minute photographic delineation of the bourgeois cockney he was unrivalled, and there was a fine breadth of character and humanity about all his efforts. While he could convulse an audience with his wild and genial extravagances, he had equal command of its sympathies when he ventured on the ground of simple pathos. In farce, burlesque, and comedy he was alike at home. An admirable mimic, he was never happier than in his good-natured imitations of his brother actors. Many farces, such as the "Area Belle," "Ici On Parle Français," "The Spitalfield Weavers," "The Pretty Horsebreaker," and "The Steeplechase," owe their popularity almost entirely to his versatility; and among his most prominent and successful impersonations are Paul Pry, Caleb Plummer in "The Cricket on the Hearth," Joe Bright in "Through Fire and Water," Uncle Dick in "Uncle Dick's Darling," and Chawles in Byron's comedy, "A Fool and His Money." He died July 30, 1906.

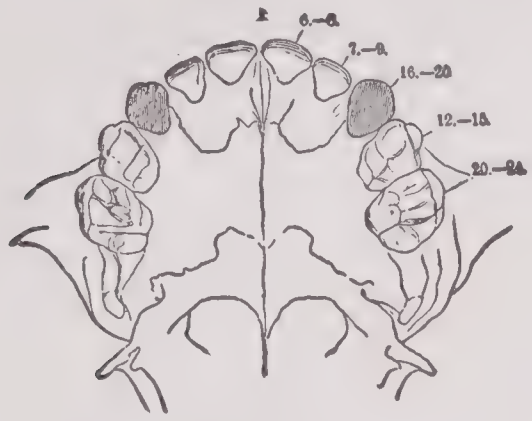
**Tool Stone,** the name given to oval or egg-shaped stones more or less indented on one or both surfaces. Their use is not at present thoroughly understood. Some antiquaries suppose that they were held between the finger and thumb, and used as hammers or chippers. If, however, a large series is obtained, it will be found that the depression varies greatly in depth, and that sometimes the stone is completely perforated, which favors the view of those who regard these implements as sinkers for nets, or small hammer heads.

**Toombs, Robert,** an American statesman; born in Wilkes co., Ga., July 2, 1810; was graduated at Union College, Ky., studied law at the University of Virginia; was a Whig member of Congress from Georgia in 1845–1853; and a United States Senator in 1853–1861. He was expelled from the Senate in 1861, and in the same year was elected to the Confederate Congress and also became Confederate Secretary of State. He resigned to become a Brigadier-General in the Confederate army. After the war he resided abroad till 1867. He refused to take the oath of allegiance to the United States government, being to the end of his life bitterly opposed to the reconstruction policy of the government. He died in Washington, Ga., Dec. 15, 1885.

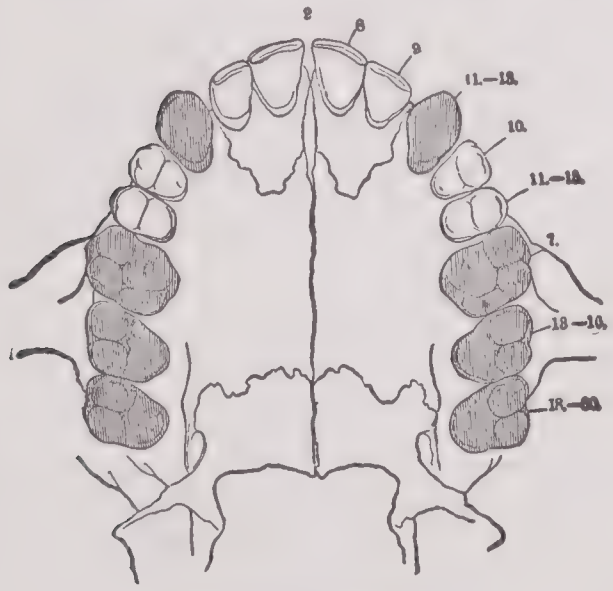
**Toon,** *Cedrela Toona,* called also bastard white cedar; a rapid-growing evergreen tree of 50–70 feet, with a girth of 6–10 feet, in-

digenous in India, where also it is widely cultivated. The mahogany-like reddish heart wood is light, even, but open-grained, not strong, seasons readily, is easily worked, not liable to warp, and polishes well. It is highly valued as a furniture wood, and is used for door-panels, carving, etc. The bark is powerfully astringent, and from the flowers a yellowish or reddish dye is made. Other species of this genus of *Meliaceæ* yield valuable timber, as *C. odorata* of the West Indies, and the Australian variety of *C. Toona*, called sometimes *C. Australis*. *C. serrata* of the Himalayan valleys has a lighter-colored and more open wood than the toon, resembling that used for cigar boxes.

**Tooth,** one of the hard bodies in the mouth, attached to the skeleton, but not forming part of it, and developed from the




FIRST TEETH.
The figures refer to months after birth.




SECOND TEETH.
The figures refer to years after birth.

dermis or true skin. "They present," says Owen, "many varieties as to number, size, form, structure, position, and mode of attachment, but are principally adapted for seizing, tearing, dividing, pounding, or grinding the food. In some species they are modified to serve as formidable weapons of offense and defense; in others, as aids in locomotion, means of anchorage, instruments for uprooting or cutting down trees, or for transport and working of building materials. They are characteristic of age and sex; and in man they have secondary relations, subservient to beauty and to speech. Teeth are always intimately related to the food and habits of the animal, and are therefore highly interesting to the physiologist; they form, for the same reason, important guides to the naturalist in the classification of animals."



True teeth consist of one, two, or more tissues, differing in their chemical composition and in their microscopical appearances. Dentine, which forms the body of the tooth, and "cement," which forms its outer crust, are always present, the third tissue, the "enamel," when present, being situated between the dentine and cement. The dentine, which is divided by Owen into hard or true dentine, vaso-dentine, and osteo-dentine, consists of an organized animal basis, disposed in the form of extremely minute tubes and cells, and of earthy particles. The tubes and cells contain, besides the calcareous particles, a colorless fluid, which is probably transuded blood plasma, or liquor sanguinis, and contributes to the nutrition of the dentine. In hard or true dentine the dentinal tubes proceed from the hollow of the tooth known as the pulp cavity, in a slightly wavy course, nearly at right angles to the outer surface. "The hard substance of the tooth is thus arranged in hollow columns, perpendicular to the plane of pressure, and a certain elasticity results from these curves; they are upright where the grinding surface of the crown receives the appulse of the opposing tooth, and are horizontal where they have to resist the pressure of contiguous teeth. The tubuli also receive the plasma transuded from the remains of the vascular pulp, which circulates by anastomosing branches of the tubuli through the dentine, maintaining a sufficient though languid vitality of the system. The delicate nerve branches on the pulp's surface convey sensations of impressions affecting the dentine — sensations of which every one has experienced the acuteness when decay has affected the dentine, or when mechanical or chemical stimuli have "set the teeth on edge.' When a part of the primitive vascular pulp from which the dentine is developed remains permanently uncalcified, red blood is carried by "vascular canals" into the substance of the tissue. Such dentine is called vaso-dentine, and is often combined with true dentine in the same tooth, as, for example, in the large incisors of certain rodents, the tusks of the elephant, and the molars of the extinct megatherium. When the cellular basis is arranged in concentric layers around the vascular canals, and contains "radiated cells," like those of bone, this is termed osteo-dentine, and resembles true bone very closely. The cement always

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corresponds in texture with the osseous tissue of the same animal, and wherever it occurs in sufficient thickness, as on the teeth of the horse or ox, it is traversed like bone by vascular canals. Moreover, when the osseous tissue contains minute radiated cells, precisely similar cells are likewise present in the canal, and constitute its most marked characteristic. The relative densities of dentine and cement vary according to the amount of earthy matter. In the complex grinders of the elephant and some other animals the cement, which forms nearly half the mass of the tooth, wears down sooner than the dentine. The enamel is the hardest of all the animal tissues, and contains no less than 96.4 per cent. of earthy matter (mainly phosphate of lime), while dentine contains only 72 per cent., and cement and ordinary bone only 69 per cent. of earthy matter. The earthy matter is contained in comparatively wide canals, composed of animal membrane of extreme tenuity.

In a few fishes the teeth consist of a single tissue — a very hard kind of non-vascular dentine. Teeth consisting of dentine and vaso-dentine are very common in fishes. Dentine and cement constitute the grinding teeth of the dugong. In the teeth of the sloth the hard dentine is reduced to a thin layer. "The human teeth and those of the carnivorous mammals appear at first sight to be composed of dentine and enamel only; but their crowns are originally, and their fangs are always covered by a thin coat of cement. There is also commonly a small central tract of osteo-dentine in old teeth. The teeth called compound or complex in mammalia differ as regards their composition from the preceding only by the different proportion and disposition of the constituent tissues. Far more complex forms of teeth than this may be produced by peculiar arrangements, chiefly inflections, of the tissues. Another kind of complication is produced by an aggregation of many simple teeth into a single mass, as in some fishes and a few mammals. The teeth of the aard-vark are of this kind, each tooth being composed of a congeries of long and slender prismatic denticles of dentine, which are cemented together. In the elephant the compound molars belong to this class, the denticles being in the form of plates vertical to the grinding surface, and transverse to the long diameter of the tooth.

The teeth of fishes, in regard to their number, form, substance, structure, situation, or mode of attachment, offer a greater and more striking series of varieties than do those of any other class of animals. In all fishes the teeth are shed and renewed, not once only, as in mammals, but frequently during the whole course of their lives. Tortoises and turtles, toads, and certain extinct Saurians are toothless. Frogs have teeth in the upper, but not in the lower jaw. Newts and salamanders have teeth in both jaws and upon the palate; and teeth are found on the palate as well as on the jaws of most serpents. In reptiles, as a general rule, the base of the tooth is anchylosed to the bone which supports it. The completion of a tooth is soon followed by preparation for its removal and succession, the faculty of developing new tooth germs being apparently unlimited in this class. The extinct *Odontornithes* are the only birds with teeth. Of mammals there are a few genera and species devoid of teeth. The true ant-eaters, the pangolins, and the echidna are strictly toothless. The ornithorhynchus has horny teeth, and the whales have transitory teeth, succeeded in the upper jaw by whalebone. The narwhal has a peculiar development. The elephant has never more than one entire molar, or parts of two, in use on each side of the upper jaws; to which are added two tusks, which are modified incisors, more or less developed, in the upper jaw. The boar's tusks are large and powerful canines. Some rodents have two grinders on each side of both jaws, which, added to the four cutting teeth in front, make 12 in all; but the common number of teeth in this order is 20, though hares and rabbits have 28 each. The number of teeth, 32, which characterizes man, the apes of the old world, and the true ruminants, is the average one of the mammals. The dentition is often summarized as to the number and position of incisors, canines, molars, and pre-molars, thus: the dental formula of the typical mammal is *inc.* $\frac{3}{3}\frac{3}{3}$, *can.* $\frac{1}{1}\frac{1}{1}$, *pm.* $\frac{4}{4}\frac{4}{4}$, *m.* $\frac{3}{3}\frac{3}{3} = 44$; or more briefly $\frac{3}{3}\frac{1}{1}\frac{4}{4}\frac{3}{3}$. The absent teeth may be denoted by $\frac{0}{0}$ or by a blank. Dolphins may have 200 teeth, and the tongue of the common garden snail 135 rows of 105 teeth each — 14,175 in all. It is only in the mammals that we have a well-marked division of the teeth into the four kinds of incisors, canines, premolars, and molars, each of which claims a brief description.

The incisors, or cutting teeth, are situated in front, and possess a single conical root or fang, and a vertical crown bevelled behind, so as to terminate in a sharp cutting edge. These teeth are specially fitted, as their name implies, for cutting the food. In man there are two of these incisors in each side of each jaw (in the pre-maxilla). The permanent incisors, molars, and premolars are preceded by a set of deciduous or milk teeth, which are lost before maturity, and replaced by the permanent ones. In herbivorous animals they crop the herbage; in rodents (the rabbit, hare, rat, beaver, etc.,) these teeth are very much developed, and differ from any other teeth occurring in mammals in this respect, that their growth continues throughout life; and if their length does not constantly increase, it is because their free extremity or edge is worn down by tritura-

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tion as fast as they grow at the base from their roots.

The canines (so called from their prominence in the dog) come next to the incisors. Their crown is rather conical than wedge-shaped, and their fang sinks more deeply into the jaw than in the case of the incisors. In all carnivorous animals they are largely developed, being obviously formed for tearing the flesh of their prey. In man there is one canine tooth in each half-jaw; and there is never more than this number in any of the lower animals.

The premolars (known also as bicuspids and false molars) come next in order to the canines; they are smaller than the latter, and their crown presents two pyramidal eminences. In man there are two premolars in each half-jaw. Their function more nearly approaches to that of the true molars behind them, than to that of the canines.

The true molars (or multicuspids) are placed most posteriorly. They are remarkable for their comparatively great size, the square form of the upper surface, on which are from three to five elevations or cusps, and for their short root, which is divided into from two to five branches, each of which is perforated at its extremity. They appear first in the permanent set. In man there are three molars in each half-jaw, the posterior one being termed the wisdom tooth, from its being cut the latest; they are especially employed for grinding the food, under the action of the muscles of the lower jaw.

The teeth are so admirably adapted for the special purposes which they are called on to fulfil that it is generally easy, from a careful examination of them, to say to what class of animals they belong, and to draw various conclusions regarding the habits and structure of the class generally. Thus, in carnivorous animals the molars are not grinding teeth, but present sharp cutting edges, and those of the upper and lower jaw overlap each other, resembling a pair of scissors in their action. In insectivorous animals the molars have a tuberculated surface, with conical points and depressions, so arranged as to lock into each other. In frugivorous animals, living on soft fruits, these teeth are provided with rounded tubercles, while in herbivorous animals they have a broad, rough surface, resembling a millstone.

There is also a close connection between the articulation or joint of the lower jaw and the nature of the food used by the animal. Thus, in purely carnivorous animals, in which the teeth simply tear and cut the food, no grinding motion is required, and the jaw is capable only of a simple hinge-motion in the vertical plane; while in herbivorous animals the joint is so constructed as to allow of extensive sliding and lateral motion of the lower molar teeth upon the upper. In man both the form of this articulation and the general character of the teeth point to an intermediate position in relation to food, and form a physiological argument for the mixed diet which general custom has decided to be most natural to our species.

*Diseases of the Teeth.*— Decay (caries) is by far the most common of the diseases which affect the teeth, and consists in a gradual and progressive disintegration of the tooth substance. Among the chief predisposing causes are hereditary defects of quality; imperfect calcification; pits and grooves in the enamel; overcrowding of the teeth; facilitating the retention of particles of food between them, constitutional disorders; chiefly those affecting the digestive organs; and debilitating causes generally — *e. g.,* over-exertion of nervous and mental energies. The exciting cause of caries has recently been proved by Professor Miller of Berlin to be due to the action of micro-organisms. According to him, "the first stage of dental caries consists in the decalcification of the tissues of the teeth by acids which are for the greater part generated in the mouth by fermentation," the agents concerned in the process being micro-organisms and the acid they produce — lactic acid.

Decay is rarely met with on smooth surfaces exposed to the friction of food and the direct washings of the saliva. It usually begins in some pit or groove in the enamel or between the teeth, such points forming a lodgment for the development of the organisms. Once the enamel has been penetrated the decay proceeds more rapidly, spreading laterally beneath the as yet healthy enamel and toward the pulp. The more dense the structure of the tooth the more directly does the decay penetrate in the direction of the pulp, though its process is not so rapid and its tendency to spread is less. Caries is most common in early life, by far the greater number of cavities making their appearance between the ages of 6 and 18. Its color varies from pale brown to black, and generally the lighter the color the more rapid is the decay. Pain may be felt soon after the enamel has been penetrated, or may be delayed until the nerve (pulp) has become almost or quite exposed; yet, strangely enough, it is sometimes altogether absent, particularly in very hard teeth. When the pulp has become nearly encroached on, the patient's sensations will warn him against taking hot or cold, sweet or acid fluids. Ultimately the pulp becomes exposed when the pain increases and may become very violent, especially if the nerve be pressed on by food forced into the cavity by mastication. Should this take place the pulp becomes acutely inflamed and soon dies, when the pain may either cease or go on till an alveolar abscess is formed.

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The treatment of caries can only be undertaken by the dentist, and varies with the extent and character of the disease.

*Periostitis and Alveolar Abscess.*— Periostitis is an inflammation of the membrane (periosteum) which covers the roots of the teeth and lines their sockets. It may be either general or local. When general the majority or all of the teeth are commonly involved. Periostitis of this type is usually due to constitutional causes (such as rheumatism), or the effects of some such agent in the system as mercury, or the presence of accumulated tartar about the necks of the teeth. When the disease is local — confined to one or two teeth — it may result from a blow or some such injury, or it may proceed from an inflamed pulp; but by far the most common cause is the presence of a dead nerve, the poisonous products of which are liable at any time to cause violent inflammation at the end of the root. Yet it is not uncommon to find that teeth whose pulp dies and whose substance gradually breaks down and decays away do not give rise to any trouble. When acute periostitis has fairly set in, it and its usual accompaniment, alveolar abscess, are perhaps the most painful affections to which the teeth are subject. The symptoms vary in intensity, though the characters remain the same. A dull aching pain is felt, and is relieved at first by pressure on the affected tooth; as the inflammation increases in severity the tooth rises slightly in its socket, and becomes exquisitely painful when bitten on; the gum around it becomes congested, and the throbbing pain is almost continuous.

Alveolar abscess may be defined as a suppuration around the root or roots of a tooth. It is of two varieties, acute and chronic. Its causes are those of periostitis, which precedes it, the continuous and throbbing nature of the pain indicating the formation of matter (pus) within the surrounding bone. The face, with the glands about the neck, swell, and the glands exhibit tenderness on touch. The pent-up pus forces its way through the bone to reach the surface of the gum at the point of least resistance, which is most often opposite the end of the root or roots (this is popularly known as a "gum boil"). It occasionally finds its way along a canal by the side of the root, and discharges at the edge of the gum. Sometimes the discharge burrows downward to find an exit on the face. This is almost peculiar to the lower teeth, and calls for removal of the tooth affected. With the escape of pus by "gum boil" there is a marked abatement in the intensity of the pain, which generally disappears in a few hours and the swelling in a few days. If left to itself, however, the abscess soon assumes the chronic form, the tooth becoming almost if not quite comfortable. This condition may continue for an indefinite period, but there may also be a recurrence of the symptoms in a milder form. Not infrequently chronic abscesses occur without giving rise to any pain, the only evidence of their existence often being a small fistulous opening on the surface of the gum, from which from time to time pus discharges. Even this last may be wanting. If the abscess resist all treatment, the disease can be cut short by the extraction of the tooth, though many cases can be successfully treated and the tooth rendered permanently useful.

Exostosis is characterized by an increase in the thickness of the cementum, the external of the two hard tissues forming the roots of the teeth. Its forms vary from a small nodule or patch to a quantity sufficient to invest the entire root or roots of the same or adjoining teeth. It is most often caused by slight but continued irritation of the periosteum by caries, or by rapid wearing of the masticating surfaces. Occurring as it sometimes does in teeth otherwise sound, its diagnosis is difficult; its presence may not be suspected till an attempt is made to extract the tooth, which, owing to the enlargement of the fangs, cannot even when loosened be removed without great difficulty. Exostosis may often cause neuralgic pains about the jaws.

*Impaction and Difficult Eruption of the Wisdom and other Teeth.*— It is not uncommon to find certain of the temporary teeth firmly set in the adult jaw, and occupying the place of the permanent ones. In such cases the permanent tooth is usually present in the body of the jaw, but it has been retarded in eruption by being too deeply imbedded in the bone. Impaction may also be due to an abnormal direction of growth. Such teeth may appear late in life after all the others are lost, and the bone overlying them has been absorbed and so exposed them. When these cases do occur they are responsible for the popular but incorrect idea of a third set of teeth. An impacted tooth seldom gives rise to any trouble, unless it be an upper or lower wisdom, particularly the latter. The cutting of these teeth is sometimes accompanied by distressing symptoms which may be protracted for months or years, unless they are removed by extraction of the tooth. This condition is usually due to imperfect development of the jaw. The tooth usually takes its natural vertical direction, but, being wedged in between the tooth in front and the ascending portion of the jaw behind, only a small portion of the crown is visible. The overlying gum is apt to be bruised by the occlusion of the opposing tooth in the upper jaw; inflammation is thereupon set up, and being maintained by biting may extend to the surrounding parts. Swallowing

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becomes painful and the motion of the jaws restricted. When it is evident that there is insufficient accommodation in the jaw for the erupting tooth it should be removed.

Inflammation of the gums, though not a disease of the teeth proper, is one of the most common causes of their premature loss. It may arise from constitutional causes — chronic dyspepsia, rheumatism or gout — or from the administration of such drugs as mercury or iodide of potassium. Most often, however, it results from the presence of tartar about the necks of the teeth, and lack of thorough cleansing. When due to constitutional causes, their appropriate remedies are called for; but when due to the presence of tartar, this deposit should be carefully removed.

*Absorption of the Alveoli.*— The gradual wasting of the bone which surrounds and supports the roots of the teeth, accompanied by a simultaneous recession of the gums, is one of the changes which mark the approach of old age. This wasting may, however, occur in middle life without any visible cause, though the majority of such cases are due to chronic inflammation of the gums, with or without the deposition of tartar. Hereditary, or the use of too hard a tooth brush, may likewise be accountable. The teeth most affected are the front ones; but the reverse of this is not unusual. The gums, especially in front, gradually recede and lay bare the roots; the teeth now become loosened and finally drop out. The treatment consists in the removal of any obvious source of irritation; but when the disease is due to heredity nothing can be done to arrest its course.

Abrasion of the teeth is a gradual loss of their substance from causes which are purely mechanical. The more common cause is a faulty occlusion of the jaws, but it is also produced by the improper use of the tooth brush. When the result of malocclusion, it shows itself on the grinding surfaces of the back teeth and the cutting edges of the incisors, which may become rapidly worn down almost to the gum, the rate of progress being frequently hastened by the common habit of grinding the teeth together. When caused by improper brushing it is seen on the front surfaces.

Erosion of the teeth, on the other hand, though closely resembling the second form of abrasion, is understood to be due to the secretion of a corrosive acid by the labial glands. It is first seen near the gums as a small concave depression with a smooth polished and often very sensitive surface continuous with the front of the tooth. As it progresses, the pulp recedes, throwing out successive layers of protective dentine till it becomes entirely calcified. The disease can generally be arrested by filling, preferably with gold or porcelain inlays.

Diseases of the antrum, while springing from other sources, are often caused by diseased teeth. The cavity in the bone of the upper jaw, known as the antrum of highmore, communicates by a small opening with the nose, and is sometimes the seat of inflammation set up by the presence of an abscess in connection with one of the back teeth, the roots of which project into it. The most common symptom of such a condition is an offensive discharge from the nostril of the affected side, increased in quantity when the patient lies down. The treatment is very tedious, much depending on the age and general health of the patient; it consists in the removal of any diseased teeth from the affected side. This extraction may be followed by a discharge of pus; if not, an opening into the antrum should be made through the socket of one of the roots, and the cavity drained, suitable stimulating and disinfecting lotions being injected by means of a syringe till a healthy condition is established. Among the less common forms of disease which attack the teeth and gums are necrosis, dentigerous cysts, odontomes, epuloid and polypoid and other tumors of the jaws, and diseases of the tooth-pulp itself. These, however, are so comparatively rare as to be of no interest to the general reader.

Toothache is not so much a disease as a symptom. Its chief causes are mentioned under caries and alveolar abscess. The pain, which varies greatly in degree, character, and duration, depends largely on its cause, and the health of the patient at the time of the attack. Only a transient uneasiness may in some instances be felt, and, as often, in others almost insupportable agony. If neuralgic in character it most frequently occurs in paroxysms at more or less regular intervals. When toothache is due to caries with or without simple exposure of the pulp, the attack is brought on by taking hot or cold, sweet or acid fluids, and is seldom of long duration. To afford relief in such cases as these, gently wash out the cavity with a solution of carbonate of soda; then, drying it carefully with a piece of cotton-wool, take a very small pellet of wool dipped in eucalyptus oil and place it in the bottom of the cavity; over this place a piece of cotton wool large enough to fill the cavity and saturated with the following solution: 1 drachm of mastic in 1½ ounce of eau de Cologne. This should be changed daily. When the pain is caused by the forming of an alveolar abscess the tooth will be found insensitive to change of temperature but very susceptible to pressure. The patient now becomes feverish, and the pain, which is at first of a dull heavy character, becomes more intense, throbbing, and continuous, till pus has been formed and discharged through the gum. Provided the

tooth is likely to prove useful and the patient cannot consult a dentist, the gum should be carefully painted with tincture of iodine, or the old-fashioned plan of placing a roasted fig over the root may be resorted to; at the same time it is well to give an aperient such as Epsom salts, followed by a full dose of quinine—6 to 8 grains for an adult. Great relief follows this treatment, which is, of course, only temporary. If an abscess shows signs of pointing on the gums it may with advantage be lanced. Poultices should never be applied to the face, for heat tends to draw the pus outward. Abscesses in connection with the lower wisdoms often assume a very serious character unless cut short by extraction of the tooth.

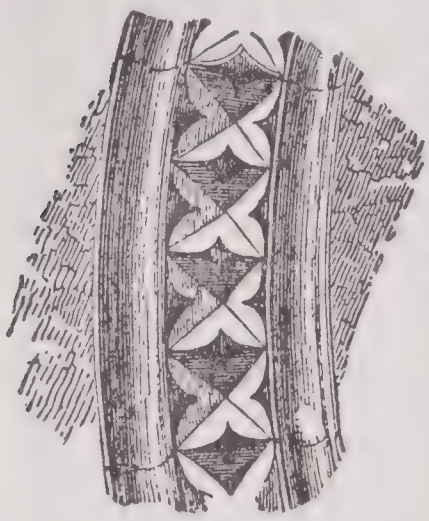
*Hygienic Care of the Teeth.*—Many of the diseases of the teeth and gums might be prevented or greatly retarded by proper attention to the cleansing of these organs. The implements best fitted for this purpose comprise the quill toothpick, waxed silk thread and brushes, with suitable powders. The toothpick ought to be used after every meal, but it should be supplemented by the use, between the teeth, of floss silk, which will remove deposits accumulating where contiguous teeth touch. The brush is used to remove all deposits solid and mucous, and it gives the teeth a bright and polished appearance; its mechanical friction too stimulates the gums to more healthful action. An excellent tooth powder is composed of precipitated chalk, 2 ounces; light magnesia, 2 ounces; oil of cinnamon, 8 drops; thymol crystals, 4 grains; otto of roses, 10 drops. The teeth should be brushed twice daily, in the morning and in the evening. The manner of using the brush is more important than many people suppose. The general method is to brush horizontally, but a moment's reflection will show that this leaves untouched the very situations most in need of cleansing. The brush, used properly, should be pressed against the teeth and the handle rotated so as to make the bristles sweep vertically between and over them; this, coupled with a up-an-down motion, will thoroughly cleanse the interspaces; the inner surfaces of the back teeth are best cleaned in a like manner, while the corresponding parts of the upper and lower incisors are effectually reached by a vertical drawing movement. The brush should be of medium texture, and the bristles of unequal length, and not too closely placed. A hard-and-fast rule cannot, of course, be laid down for every one to follow, but in the majority of cases it is advisable to use the powder in the morning and a mouth wash with the brush in the evening. For the latter purpose the following is good (especially where a tendency to inflammation exists)—tannic acid, 4 grains; rose water, 1 ounce; tincture of pyrethrum, ½ drachm; oil of cinnamon, 10 drops. Over brushing must be guarded against as carefully as under brushing, lest the gums and the necks of the teeth be injured. During an illness these precautions are doubly necessary as the corrosive effects of many medicines are then added to the evil results of a weakened vitality. The use of a glass tube in taking medicines that contain mineral acids and iron is usually supposed to be a sufficient precaution against the action of such drugs on the teeth, but this is quite erroneous; the only sure preventative being a weak solution of ordinary baking soda, with which the mouth should be rinsed after every dose. The choice of a tooth powder should be left to the dentist, for many dentifrices which, no doubt, whiten the teeth, do so by the action of some agent which is as deadly to the tooth substance as to the impurities it is meant to remove. Charcoal (so much used) is quite unsuitable because of its gritty nature. As far as the ordinary individual is concerned, the use of brush and toothpick is the limit up to which one can take care of one's own teeth, so that a thorough examination of the mouth once or twice a year by a trustworthy professional man is necessary to check the diseases of the teeth before they have gone so far as to be irreparable. Especially should this be attended to in children. It is almost impossible to overrate the importance of following, at least in the main if not in detail, the hints given above, for when we consider that the teeth are placed at the very gateway of life, it is not surprising that their neglect should be answerable for many of the disorders of the system. Surely precaution is better than cure.

**Toothache Grass,** the *Ctenium americanum*, a grass two to four feet high, with rough, narrow, flat leaves and culms, each with a single spike, having the spikelets in two rows. The root has a very pungent taste.

**Toothache Tree,** the genus *Xanthoxylon*, and specially *X. fraxineum*, a tree about 14 or 15 feet high, found in North America from Canada to Florida; so called because its bark and its capsular fruit, which have a hot, acrid taste, are used as a remedy for toothache. A tincture of the bark has been given in rheumatism.

**Tooth-billed Pigeon,** the *Didunculus strigirostris*, from Navigator's Island. It is about 14 inches long, body rounded, beak orange, nearly as long as the head, greatly arched on the upper mandible, the lower mandible deeply cleft into three distinct teeth near the tip. Head, neck, breast, and abdomen glossy greenish black, velvety black on shoulders and upper part of black; rest of back, wings, tail, and under coverts deep chestnut. Called also the little dodo.

**Tooth Ornament,** in architecture, a peculiar decoration, extensively used in the Early English style of architecture, forming a marked feature by which it may be generally known. It may be described as consisting of a series of closely placed small flowers, each consisting of four leaves, which project forward to a central point. These are generally placed in hollow moldings, and are used in great profusion.



TOOTH ORNAMENT.

**Tooth Shell,** in zoölogy, a popular name for any species of the genus *Dentalium*, from the fact that these shells bear some resemblance to the canine teeth of small carnivorous animals.

**Toothwort,** in botany, the genus *Lathræa*, and specially *L. squamaria;* named from the tooth-like scales of the root-stock and the base of the stem. But E. Lees, quoted by Britton & Holland, says that after flowering, when the capsules are half ripe, they remarkably resemble human teeth, both in form and color.

**Toparchy,** in ancient history, a small state or lordship, consisting only of a few cities or towns; or a petty country under the sway of a ruler called a toparch. Thus Judea was anciently divided into 10 toparchies.

**Topaz,** a mineral, ranked by mineralogists among gems, characterized by having the luster vitreous, transparent to translucent; the color yellow, white, green, blue; fracture subconchoidal, uneven; sp. gr. 3.499. It is harder than quartz. It is a silicate of aluminium, in which the oxygen is partly replaced by fluorine. It occurs massive and in crystals. The primary form of its crystal is a right rhombic prism. Topazes occur generally in igneous and metamorphic rocks, and in many parts of the world, as Cornwall, Scotland, Saxony, Siberia, Brazil, etc. The finest varieties are obtained from Brazil and the Ural Mountains. Those from Brazil have deep yellow tints; those from Siberia have a bluish tinge; the Saxon topazes are of a pale wine-yellow, and those found in the Scotch Highlands are of a sky-blue color. The purest from Brazil, when cut in facets, closely resemble the diamond in luster and brilliance.

**Topaza,** kings or king humming birds; a genus of *Trochilidæ*, with two species, having two tail-feathers elongate and crossed. *T. pella*, the more common species, is found in Guiana and Trinidad, extending into Brazil and up the Amazon, being replaced on the Rio Negro by *T. pyra*.

**Topazolite,** a variety of garnet found in small crystals of a topaz-yellow color at Ala, Piedmont. Dana includes it among the lime-iron garnets (andradite).

**Topaz Rock,** a rock occurring at Schneckenstein, Saxony, consisting of large fragments of tourmaline-schist containing topaz, cemented together by quartz and lithomarge, topaz also being crystallized on the walls of the cavities. Forms a vein of considerable thickness in the mica schist.

**Tope,** in ichthyology, a popular name for either of the species of the genus *Galeus*. The common tope, *G. canis*, is widely distributed throughout all temperate and tropical seas, ranging as far as California and Tasmania. It is about six feet long, dark ash gray above and white below. It is often called the miller's dog and penny dog, though, according to some authorities, the first name is properly applicable only to young fish.

In archæology, the popular name for a particular kind of Buddhist monument common in India and the S. E. of Asia.

TOPE.

The word tope has reference to the general form of the monument, which is a particular form of or development from the tumulus and may be: (1) Memorial, built on celebrated spots. (2) Dedicatory, concentrated to the Supreme Buddha. (3) Sepulchral, containing remains or relics, in which case they are properly termed dagobas, and are frequently found in temples. The other forms are usually independent structures. From Pali Buddhistic writings it appears that topes were in existence before the time of Sakya, and were objects of reverence to the people. The oldest topes are in the shape of cupolas, generally spherical, but sometimes elliptical, resting on a cylindrical, quadrangular, or polygonal base, rising either in a straight or in an inclined line, or in terraces. The top, surrounded by a balcony of pillars, is generally crowned by a structure, generally quadrangular, but sometimes having the shape of an inverted pyramid, and over this is a roof in the

shape of an inverted umbrella. Sometimes several umbrellas are present, placed one over the other, as is the case in a rock-cut tope in Ajunta, where they assume somewhat the character of a spire. The largest topes were probably dedicatory; the most numerous are the sepulchral topes, built of all sizes, and of all kinds of material, according to the rank of the deceased. The cupola was intended to represent the water bubble, the Buddhistic symbol of the hollowness of the world; and the extended umbrella probably typified the royal dignity possessed by a Buddhist saint. The number of terraces and stories had likewise a symbolical import.

**Topeka,** a city, capital of the State of Kansas, and county-seat of Shawnee co.; on the Kansas river, and the Chicago, Rock Island, and Pacific, the Union Pacific, the Atchison, Topeka and Santa Fé, the Missouri Pacific, the Leavenworth, Topeka, and Southwestern railroads; 67 miles W. of Kansas City. Here are the State Capitol, the State Reform School, the State Asylum for the Insane, the Kansas Medical College, College of the Sisters of Bethany, Washburn College (Con.), United States government building, street railroad and electric light plants, waterworks, National and State banks, and several daily, weekly and monthly periodicals. According to the United States census of 1900 there were reported for the city 399 manufacturing establishments, with a combined capital of $3,891,530; employing 3,758 persons; paying for wages $2,110,721; and for material $6,911,064; and having an output valued at $9,977,605. The chief industry is the manufacture of flour. There are also large railroad shops. The assessed property valuation exceeds $10,000,000. Pop. (1890) 31,007; (1900) 33,608; (1910) 43,684.

**Topelius, Zacharias,** a Finnish author; born near Ny Karleby, Finland, Jan. 14, 1818. He became editor of the "Helsingfors Tidningar" in 1842, retaining his connection with it till 1860. His earliest productions appeared in his journal; some of them were issued later in book form under the title "Heather Flowers" (1845-1854). He also wrote a number of dramas, "Fifty Years Later" (1851); "Regina of Emmertz" (1854). Many of his juvenile stories have been translated into English. His best-known work is "The Surgeon's Stories" (1872-1874), a collection of tales dealing with the history of Sweden and Finland during the 17th and 18th centuries. He died in Helsingfors, Finland, March 12, 1898.

**Töpfer, Karl,** a German dramatist; born in Berlin, Germany, Dec. 26, 1792. Among his comedies are "The Best Tone," "Courting According to Prescription," "Rosenmüller and Finke." He wrote also "Narratives and Stories" (2 vols. 1842-1844). He died in Hamburg, Germany, Aug. 22, 1871.

**Tophet,** in Scripture, a place in the immediate vicinity of Jerusalem, considered by Milton to be identical with the valley of Hinnom, but described in Scripture as in that valley (II Kings xxiii: 10; Jer. vii: 31). It was S. E. of Jerusalem (Jer. xix: 2), and had been prepared of old for some king of Israel, or for Moloch (Isa. xxx: 33). Whatever its primary design, "high places" were erected there, and it became the chief seat of the worship of Moloch in Palestine (II Kings xxiii: 10; Jer. vii: 31). Josiah not merely stopped that cruel form of idolatry, but defiled the place (II Kings xxii: 10; Jer. xix: 13), apparently by making it the receptacle of the filth of the capital. It became a burial ground, ultimately overcrowded with bodies (Jer. vii: 31, 32; xix: 6, 11).

**Topic,** the subject of a discourse, argument, literary composition, or conversation; the subject of any distinct portion of a discourse, etc.; the matter treated of; theme. In rhetoric, a general truth or statement applicable to a great variety of individual circumstances; a general maxim or dictum regarded as being of use in argument or oratory; a general head or department of thought to which any maxim belongs; one of the various general forms of argument to be employed in probable, as distinguished from demonstrative reasoning.

**Topical Coloring,** a term used in calico-printing to indicate that the color or mordant is applied to specific portions of the cloth forming the pattern, in contradistinction to the application of color to the cloth in a dye bath.

**Topin, Marius,** a French historian; born in Aix, France, Dec. 25, 1838. He wrote: "The Cardinal de Retz, his Genius and his Writings" (1864); "History of Aigues-Mortes" (1865); "Europe and the Bourbons under Louis XIV." (1867); "The Man in the Iron Mask" (1869); "Contemporary Novelists" (1876).

**Toplady, Augustus Montague,** an English theologian and hymnologist; born in Farnham, Surrey, England, Nov. 4, 1740; was educated at Westminster and Trinity College, Dublin. After holding a curacy for some years in Somersetshire, he was presented in 1768 to the vicarage of Broadhembury, Devonshire. His works were published in six volumes in 1825; new edition in one volume, 1837, with a memoir. Though a voluminous writer—and a strenuous defender of Calvinism against John Wesley—Toplady is now hardly known except as the author of the hymn, "Rock of Ages," one of the most exquisite expressions

of evangelical faith and fervor to be found within the compass of the English tongue. A Latin version by Mr. Gladstone ("Translations by Lord Lyttleton and the Right Hon. W. E. Gladstone," 1861) has added fresh beauty to the original. He died in London, Aug. 11, 1778.

**Topography,** "description of places," a detailed account of the superficial features of a tract of country, of any natural object such as a hill or river, or of a city, street, or public building. Topography is distinguished from geography in being descriptive and more detailed.

**Topography, Military,** the minute description of places with special reference to their adaptability to military purposes. Where a good military map of a district at the seat of war is not in existence, officers are required to make good the deficiency by personal observations. Distances are calculated by paces or the eye, and the general features of the country, its hills, valleys, rivers, roads, woods, etc., carefully noted. Such instruments as the pocket sextant and the prismatic compass are valuable in topographical expeditions. The results as ascertained are called a topographical survey. It is the business of topographical engineers of the army in time of peace to secure all possible information of countries which may subsequently become theaters of war.

**Topolobampo Colony,** the name of a coöperative enterprise founded by Americans in 1887 on Topolobampo Bay, Sinaloa, Mexico. They established two settlements, one on the N. shore of the "Strait of Joshua," "Topolobampo," and another, "Vegaton," on the Fuerte river. These town sites occupied respectively about 18,000 and 1,500 acres, and were about 35 miles apart. The colonists surveyed and laid out about 18,000 acres on the N. shore of Topolobampo Bay into avenues, streets, walks, parks, circles, quays, drives, etc., the public areas occupying about 40 per cent. of the whole. The experiment was a failure and the colony was abandoned in 1891. It was an attempt to realize Edward Bellamy's social city, described in "Looking Backward."

**Topophone.** See EOPHONE.

**Toppfer** (or **Töpffer**), **Roldolphe,** a Swiss littérateur; born in Geneva, Feb. 17, 1799. His father was a painter, and he wished to be one also, but an affection of the eyes prevented. He wrote: "Zigzag Tours" (1843); "The Heritage" (1834); "Rosa and Gertrude" (1846); "Travels and Adventures of Dr. Festus" (1840); etc. He died, June 8, 1846.

**Top-shells,** the *Turbinidæ*, a family of gasteropodus mollusks in which the shell is usually turbinate or top-shaped, but may be pyramidal. It is generally nacreous internally. The operculum is horny, and may exhibit a spiral form. In turbo itself the shell is top-shaped with a rounded base. The whorls are convex, and the aperture is large, the operculum being calcareous. The genus *Trochus* also belongs to the top-shells. In the latter genus the shell is pyramidal and the base flattened, the operculum being horny. The common top is the *T. zizyphnus*. Others are the *Turbo versicolor*, the *T. Imperialis*, and the *T. niloticus*.

**Torbanehill Mineral,** a body very rich in volatile carbon compounds, found near Bathgate in Scotland. The deposit is now nearly exhausted, but at one time it was in great request for enriching gas and for the distillation of paraffin oil. It gave rise to a famous lawsuit, in which the question "What is coal?" was keenly discussed from a scientific point of view.

**Torbert, Alfred Thomas Archimedes,** an American military officer; born in Georgetown, Del., July 1, 1833; was graduated at the United States Military Academy in 1855; spent five years on frontier duty in Texas, Florida, New Mexico and Utah; was promoted 1st lieutenant in February, 1861. He was commissioned colonel of the 1st New Jersey regiment in September, 1861, and was promoted captain in the 5th United States Infantry in the same month. In the latter half of 1862 he won distinction in the battles of Manassas and Crampton's Gap; was made Brigadier-General of volunteers on Nov. 29, of that year. He afterward took part at Gettysburg, Rappahannock Station, Matadequin Creek, etc. He captured Cold Harbor on May 31, 1864, and then participated in a raid to Charlottesville. In August, 1864, he became chief of cavalry of the middle military division and under Sheridan had command of three divisions. He particularly distinguished himself on Sept. 19, 1864, when he took part in routing the enemy at Winchester, and on Oct. 9, won the cavalry battle at Tom's river. On Dec. 22 and 23 he had command at Liberty Mills and Gordonsville. In March, 1865, he was brevetted Major-General, U. S. A. for gallantry during the war. He served as consul-general to Paris in 1873-1878. He was drowned Sept. 30, 1880, while a passenger on the steamer "Vera Cruz," which foundered off the coast of Florida, while on her way to Mexico.

**Torbert, John Bryant,** an American topographic draughtsman; born in Washington, D. C., May 8, 1867; received a high school education and was graduated at the Law Department of Columbia University in 1888; was admitted to the practice in the Supreme Court of the District of Columbia in 1889. He subsequently became eminent

as a draughtsman; was engaged on the United States Geology Survey in 1886-1893. In the latter year he was transferred to the topographic office of the United States Postoffice Department. He became identified with the Geological Society of Washington and the National Geographical Society. His publications include "Africa, the Largest Game Preserve in the World."

**Torcello,** a small island in the Lagoon of Venice, 6 miles above that city. It was a place of some importance in the 10th and 11th centuries. It contains an ancient Byzantine cathedral of Santa Maria, and a church of Santa Fosca, both of which are beautiful specimens of architecture and are rich in interior decorations.

**Torch Lake,** a lake lying chiefly in Antrim co., Mich.; and separated from the E. side of Grand Traverse Bay by a narrow strip of land. It communicates with Lake Michigan. Length 14 miles.

**Torelli, Achille,** an Italian dramatist; born in Naples, Italy, May 5, 1844. He wrote at 16 his first comedy, "Who Dieth Lieth." Of his others, the most successful were: "A Court in the 17th Century," "The Mission of Woman," "Husbands" (1867); "Sad Reality" (1871); "Truth" (1875); "The Color of the Times" (1875).

**Torenia** (named after Olaf Toren, a Swedish clergyman, who discovered *Torenia asiatica* in China), a genus of *Lindernie.* Herbs with opposite leaves and racemes of personate flowers, purple, lilac, pale blue, or white. From India, tropical Australia, and South America. The juice of the leaves of *T. asiatica* is considered on the Malabar coast to be a cure for gonorrhœa.

**Torentic,** in sculpture, a term applied to such objects as are executed with high finish, delicacy and polish; but properly to all figures in hard wood, ivory, etc., and often restricted to metallic carvings or castings in basso-relievo. But in its widest sense it signifies sculpture in any style, or in any material, whether modelled, carved or cast.

**Torfeson, Thormodur,** also known as TORFÆUS; a Danish historian; born on the isle of Engoe, off the S. coast of Iceland, in 1640. His principal works, all written in Latin, are: "History of the Faroe Islands" (1695); "History of the Orkneys" (1697); "Line of the Dynasties and Kings of Denmark" (1792); "History of Old Vinland" (1705); "Ancient Greenland" (1706); "The Historic Trefoil" (1707); "History of Norway" (4 vols. 1711), his greatest work. He died in 1719.

**Torgau,** a fortified town in Saxony, Prussia; on the Elbe; 31 miles N. E. of Leipsic. It is inclosed by a wall and has manufactories of woolen goods, hosiery and leather. Its chief building is the castle, Hartenfels. It was fortified by Napoleon in 1810; was besieged by the Allies in 1813 and surrendered Jan. 14, 1814. Pop. about 11,000.

**Torgau, Alliance of,** a league formed in 1526, at Torgau, by Saxony and Hesse and other Protestant powers, against the Roman Catholic States.

**Torgau Articles,** a document drawn up at Torgau in 1530, which was the foundation of the Augsburg Confession.

**Torgau, Battle of,** a battle fought at Luptitz, near Torgau, Nov. 3, 1760, between the Prussians under Frederick the Great and the Austrians under General von Daun, in which the latter were defeated.

**Torment,** the utmost degree of misery, either of body or mind; acute pain; anguish; torture; excruciating distress or agitation; that which produces pain, anguish, vexation, or misery.

**Tormentil,** in botany, *Potentilla tormentilla,* formerly *Tormentilla officinalis.* The stem is slender, the leaves three-foliolate,

TORMENTIL

more rarely five-foliolate; the petals usually four in place of the normal five of other Potentillas. Abundant on heaths, copses, and dry pastures, flowering from June to September. The rootstock, which is very astringent, is used for tanning.

**Tornado,** a whirlwind, usually coming on suddenly, continuing but a brief period, and covering only a small area. It is generally accompanied by rain, lightning, and thunder. It is of the same type of storm as a cyclone, but more local, covering a smaller area, and generally less violent, though still sufficiently so to be highly dangerous. The term tornado is used specifically of rotating or spiral storms in the South Indian Ocean, and those on the coasts of Africa and North America.

Turpin, the famous French inventor, proposed a plan for the prevention of the destructive work of tornadoes. It is a well-

known fact that a waterspout at sea is at once dissipated by the firing of a cannon. Turpin contended that a tornado on land is the same sort of a natural phenomenon as a waterspout at sea, and may be destroyed in the same way. His plan was to build a series of towers, say 120 feet high and some 100 yards apart, along the S. W. part of the town to be protected. On top of each tower was to be some 200 pounds of high explosive so arranged with a windmill device that it would be automatically exploded by a wind approaching the intensity of a tornado. This, he claims, will destroy the tornado at once. See CYCLONE.

**Tornado Alarm,** a barometer which automatically sounds an alarm when there is a sudden change of atmospheric pressure, such as occurs in advance of a tornado, cyclone, or wind storm. This alarm is given some two minutes before the first blasts of a storm occur. The main mercury tube has a cylindrical bulb at the top and is bent in the form of a siphon. Near the lower portion of its shorter member is a secondary tube, the connection being made by means of a short tube which connects with the main tube by a very small opening. The fluid in both the larger tubes will remain normally of equal, or nearly equal height in ordinary changes of the weather, but in case of sudden atmospheric changes the small opening in the connection between the tubes restricts the movement in the secondary tube as compared with that in the main tube. Such variation in the movement of the mercury in the two tubes when sufficient to indicate an approaching storm, is made to give an alarm by means of floats in the tubes connected with wires in an electric circuit, there being on one wire a fork and on the other a tongue, by which contacts are made, to ring an alarm when the points meet. Ordinary storms have no effect at all on the apparatus.

**Tornatella,** in zoölogy, the type genus of *Tornatellidæ.* Shell solid, ovate, with a conical, many-whorled spire; aperture long, narrow, rounded in front; outer lip sharp; columella with a strong, tortuous fold; operculum horny, elliptical, lamellar. Recent species 16, widely distributed in deep water. Fossil, 70, from the Trias onward. Used also of any individual of the genus.

**Tornatellidæ,** in zoölogy, a family of *Tectibranchiata.* Shell external, solid, spiral, or convoluted; sub-cylindrical; aperture, long and narrow; columella plaited; sometimes operculated. Animal with a flattened, disk-like head, and broad, obtuse tentacles; foot ample, with lateral and operculigerous lobes. The shells of this family are chiefly extinct; they commence in the coal measures and attain their maximum in the chalk formation.

**Tornatellina,** in zoölogy, a genus of *Helicidæ,* with 20 species, from Cuba, South America, the Pacific Islands, and New Zealand. Shell imperforate, ovate, or elongated with a semi-lunar aperture, a twisted and truncated columella, and a one-plaited inner lip.

**Tornatina,** in zoölogy, a genus of *Tornatellidæ.* Shell cylindrical or fusiform, spire conspicuous, suture channeled, columella plaited. Animal with broad head, rounded in front, with triangular tentacular lobes, eyes at their base; foot truncated in front. Twenty-four recent species, widely distributed on sandy bottoms, ranging to 35 fathoms. Thirteen fossil species, from the Tertiary.

**Tornea Elf,** a river of Northern Sweden which finds its source in Lake Tornea. It forms a part of the boundary between Sweden and Finland, and flows into the Gulf of Bothnia. Length about 275 miles.

**Tornos, Alberto de,** an American educator; born in Cariñena, Spain, April 9, 1821; settled in Porto Rico in 1845 and served there as director of the seminary of teachers. He removed to the United States in 1848, and was Professor of Languages at Spring Hill College, Ala., in 1848–1851. Later he accepted the chair of languages at the University of Louisiana, where he remained for many years. He subsequently served for 20 years as Professor of Spanish at the New York evening high school. He became noted through his text-book "De Tornos's Combined Spanish Method" (1867). The sale of this publication ran into many thousands. He also was the author of a book of Spanish and English correspondence, several text-books, and two novels. He died in New York city, March 22, 1887.

**Toronto,** a city of Ontario, Canada, capital of the province, county-seat of York co., and the second city in population in the Dominion. It is situated on the N. shore of Lake Ontario, 40 miles E. of its western end, on a large sheltered bay, between the mouths of the Don and Humber rivers, on the Grand Trunk, Canadian Pacific, and Canadian Northern Ontario railways, 220 miles S. W. of Ottawa, 320 miles S. W. of Montreal (333 miles by rail), in lat. 43° 39′ 36″ N., and lon. 79° 23′ 40″ W. The Canadian Northern Ontario or James Bay railway runs to Parry Sound, and is connected with the Canadian Northern railway, which is a transcontinental system partly completed in 1907. The city has connections with all the trunk railway lines of the United States. It lies on a plateau gradually ascending from the lake shore to a height of 220 feet, generally level, with slight depressions at points where minor

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water courses formerly existed. It covers an area of 18½ square miles. South of the city is a narrow, sandy, triangular island, broken on the N. side, about 6 miles long, which encloses the bay and harbor, whose area is about 3½ square miles. The harbor is deep enough for the largest lake vessels, and is entered on the E. and W. by narrow, artificial channels. Extending along the lake front for 8 miles, and inward for 3 miles, Toronto is laid out in streets rectangular to each other. Yonge street, running N. from the lake front and extending under that name for 40 miles to Lake Simcoe, is the dividing line of the city into E. and W. The chief business thoroughfares are Yonge, King, Queen, Wellington, and Front streets, the last four being parallel with the lake front. King, Yonge, and Queen are chiefly devoted to retail, and Front and Wellington streets to wholesale trade. Of many fine residential streets, most of them well shaded, Jarvis, St. George, Sherbourne, Isabella, Shadina avenue, University avenue, Madison avenue, St. Joseph and Huron streets are the most conspicuous.

*Buildings, Parks, and Statuary.*—The most noteworthy buildings are the city hall and court house, an imposing modern Romanesque structure, with a tower 300 feet high, and an immense winding clock, said to be the largest of its kind on the continent; Provincial Parliament buildings, in the neo-Grecian style; the buildings of the University of Toronto, the chief of which, University College, is a beautiful and impressive example of Norman architecture; Osgoode Hall, the seat of the Superior Courts of the province, in the Italian Renaissance style; St. James' Cathedral, a large Early English building, with a spire 316 feet high; the Metropolitan Methodist Church; the Roman Catholic Cathedral of St. Michael; the Carnegie Public Library, Government House, Knox College, Victoria University, Trinity University, Upper Canada College, the armories, Board of Trade, Canada Life, Traders' Bank, Manning Arcade, Harbord Street, Collegiate Institute, and Temple buildings, King Edward Hotel, Provincial Lunatic Asylum, with grounds covering 40 acres, custom house, post office, customs warehouse, etc.

Toronto has a park area of 1,660 acres, distributed among 25 parks, of which High (375 acres), Exhibition (204 acres), Island (389 acres), Simcoe (150 acres), Woodbine (50 acres), Allan Gardens (10½ acres), Queen's (35 acres), and Riverdale (162 acres) parks are the principal ones. In Queen's park are situated the buildings of the Provincial Parliament and the University of Toronto, and there are monuments to Queen Victoria, to George Brown and Sir John A. Macdonald, the two chief founders of the Dominion; Gov. John Graves Simcoe, Sir Oliver Mowat, Liberal premier of Ontario for twenty-four years, and also to the memory of those who fell in the Fenian Raid of 1866, and in the Northwest Rebellion of 1885. In the grounds of the provincial normal school stands a monument to the Rev. Dr. Egerton Ryerson, founder of the Ontario public school system. Riverdale park contains a zoölogical collection. In Exhibition park are several fine buildings used for the annual Canadian National Exhibition, noted for the collection of agricultural and manufactured products, and especially for the live-stock exhibit. Island park, on the island opposite the city, and reached by several ferries, is the best known pleasure resort, with grounds tastefully laid out, boating facilities, and other attractions. High park, a well-wooded tract of much natural beauty, contains the mausoleum of the donor, J. G. Howard. Woodbine park, to the E. of the city, possesses the best known Canadian race course. Besides the parks, there are lacrosse, baseball, and cricket grounds, and golf links at Lambton in the vicinity. In 1907 a plan was being matured for a comprehensive park system and lake driveways supplemental to those already established. The Rosedale ravine has very attractive scenery. There are 3 fine cemeteries.

*Churches and Educational Institutions.*—From an architectural point of view, St. Andrew's (Presbyterian), Jarvis Street Baptist, and Bond Street Congregational churches, besides those mentioned above, are the most noteworthy; but there are many others that are worthy of attention for their attractive design and ornamentation. The large number of places of worship (206) in proportion to the population has gained for the city the name "City of Churches." They are divided among the denominations as follows: 44 Anglican, 21 Baptist, 9 Congregational, 41 Methodist, 32 Presbyterian, 15 Roman Catholic, and 44 miscellaneous.

Chief among the educational institutions of Canada is the University of Toronto (*q. v.*), which, with its federated and affiliated colleges, has an attendance of about 4,000 students. The university as now constituted includes the federated institutions of University, Victoria, and Trinity colleges (the two latter formerly Methodist and Anglican universities, respectively), and the School of Practical Science; and in affiliation with it are Knox College (Presbyterian theological), Wycliffe College (Episcopalian theological), St. Michael's College (Roman Catholic), Royal College of Dental Surgeons, Ontario College of Pharmacy, Ontario Veterinary College, Conservatory of Music, Toronto College of Music, and other educational institutions situated outside of Toronto. McMaster University is an independent Baptist institution. There are also the provincial normal and model schools, a

technical and 4 industrial schools, 3 collegiate institutes, 53 public and 16 separate (Roman Catholic) schools. Upper Canada College is a large residential school for boys, modeled to some extent after Eton and Rugby. St. Andrew's College for boys is a similar institution, and there are a dozen ladies' colleges and several business colleges.

In art, the educational facilities include the annual exhibition of the Ontario Society of Artists, the Provincial Art Gallery in the Education Department buildings, the Central Ontario School of Art, the Women's Art Association, the Toronto Art League, the Graphic Arts Club, the Society of Arts and Crafts, and other societies of similar aims and scope. Besides the new Carnegie Library, there are a large free public library with 140,000 volumes, an extensive law library at Osgoode Hall, and several libraries of scientific and literary institutions.

*Clubs, Theaters, and Hotels.*—The leading clubs are the National, Toronto, Granite, Victoria, Albany, Royal Canadian Yacht Club, and Toronto Hunt Club. The theaters include the Princess, Grand Opera House, Majestic, Star, and Shea's. Massey Music Hall is the home of musical festivals and other entertainments. The principal hotels are the King Edward, Queen's, Rossin, Arlington, Walker, Palmer, and Iroquois.

*Charities and Newspapers.*—Among the charitable institutions are the Toronto General (whose extension at a cost of $1,500,000 was in progress in 1907), St. Michael's, Grace Western, St. John's, and Sick Children's hospitals, Riverdale Hospital for Contagious Diseases, Home for Incurables, House of Industry, House of Providence, Boys' Home, Girls' Home, Orphans' Home, Mercer Reformatory, Provincial Insane Asylum, Mimico Retreat.

There are 6 daily newspapers: the "Globe," Liberal; "Mail and Empire," Conservative; "News," Independent; "Telegram," "World," "Star." There are also 49 weekly, 20 semi-monthly, 76 monthly, and 8 quarterly newspapers and periodicals.

*Industry and Commerce.*—Toronto has many extensive manufacturing establishments, and the supply of cheap electric power from Niagara falls was practically begun in 1907 by the laying of transmission lines to the city. In 1907 more than $70,000,000 of capital was invested in manufacturing, employing 60,000 hands receiving upward of $26,000,000 in wages, and with an output valued at about $75,000,000. The leading manufactures are foundry and machine-shop products, agricultural implements, stoves, leather, flour, whiskey, beer, marine engines, boilers, forgings, sewing machines, motor cars, pianos, organs, boots and shoes, furniture, sashes and doors, carriages, bolts, nuts, barbed wire, tools, etc. Large railway repair shops are situated here. It is the chief distributing center for Ontario, the Northwest provinces, and British Columbia. In the calendar year 1905 the city's imports amounted to $53,194,085. The chief exports are timber, horses, wool, bacon, grain, clover, and grass seeds. The bank clearings in 1905 were $1,047,480,701, having more than doubled since 1899. The excellent railway transportation facilities are supplemented by steamboat lines to Kingston, Hamilton, Montreal, Quebec, and many other ports.

*Government and Transportation.*—The city government is vested in a council, consisting of a board of control (composed of the mayor and 4 members) and 18 aldermen. The council as a whole is a legislative body, and the board of control the executive body. The city receives a percentage of the earnings of the electric street railway, which in 1906 had 91 miles of track. The assessed value of taxable property in 1907 was $184,283,000. The net debt of the city on Dec. 31, 1905, was $17,476,787; city assets, over $15,000,000, of which a large amount was revenue producing. Sanitation is managed by a board of health and a medical health officer. The death rate is about 17.50 per 1,000.

*History and Population.*—The name of the city is of Indian origin, signifying "place of meeting," the site having been a rendezvous for Indian tribes. It became a trading place in 1749, when the French built a fort and started a small settlement under the name of Fort Rouillé. The French abandoned it in 1759, but a fur trade had been built up, which continued to be valuable for many years. United Empire Loyalists settled in the vicinity after the close of the War of Independence, and in 1793 the first Governor of Upper Canada, Lieut.-Col. John Graves Simcoe, selected it as the capital of the province, naming it York. It was captured by the Americans in 1813, and the Parliament buildings were burned. In 1834 it was incorporated as a city under its present name. During the unsuccessful rebellion in 1837 under William Lyon Mackenzie (*q. v.*), the city, being the headquarters of the insurgents, suffered severe damages, and again in 1849 it sustained great loss by fire. After confederation in 1867 it became the capital of Ontario. On April 19, 1904, a fire destroyed $10,500,000 worth of property in the wholesale business section, but the burned area was rapidly rebuilt. In 1817 Toronto was a village of 1,200 inhabitants. In 1842, eight years after it had been incorporated as a city, its population was 15,336; 1852, 50,763; 1871, 56,092; 1881, 96,196; 1891, 181,220; 1901, 207,901; police census, 1905, 262,749; local official est., 355,000. The population is mainly of British descent and Protestant in religion.

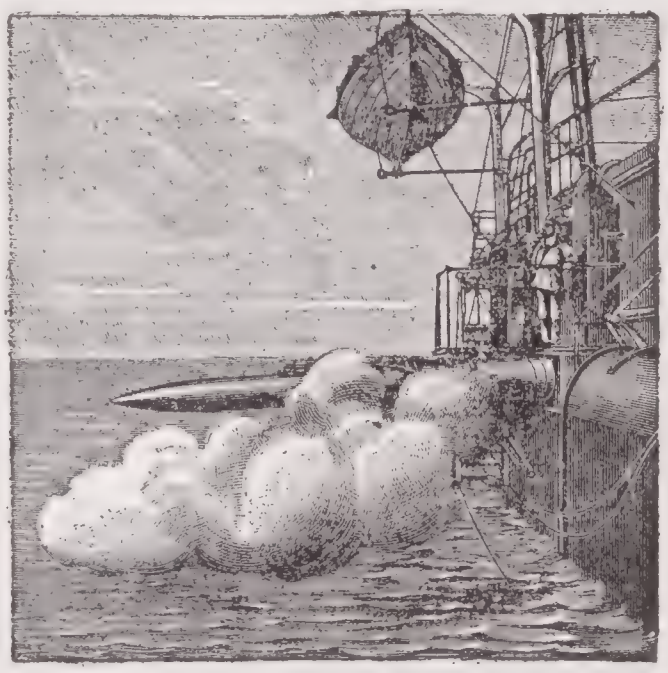
**Toronto, University of,** an institution of higher learning in Toronto, Ont., Canada, and the head of the educational system of the province. Steps were taken as early as 1797 toward the establishment of the university, when the king was petitioned for an appropriation of crown lands, but it was not until 1827 that a royal charter was granted and the institution founded under the name of the University of King's College. Owing to the sectarian character of the charter the organization of the university was delayed until 1842, when the faculties of arts, medicine, law, and divinity were established. In 1843 it was open to students, and in 1849 its name was changed to the present one; at the same time instruction in divinity was discontinued. In 1853 a reorganization divided the functions of the institution between two corporations: the University of Toronto proper, and the University College. To the latter was assigned the teaching in arts, but in 1887 this arrangement was modified by the division of that branch with the faculty of the older institution. Many colleges have been affiliated with the university (see TORONTO). Women are admitted, and university extension work is carried on by a special committee. In 1906 the professors and instructors numbered 126, the students 2,333, the library contained 80,000 volumes and 20,000 pamphlets. The endowment was $900,000, the income $250,000.

**Torpedinidæ,** in ichthyology, the electric rays; a family of *Batoidei*, with six genera, chiefly from tropical and sub-tropical seas. The trunk is a broad, smooth, disk; tail with a longitudinal fold on each side; a rayed dorsal generally, and a caudal fin always, present; anterior nasal valves confluent into a quadrangular lobe; an electric organ composed of vertical hexagonal prisms between the pectoral fins and the head.

A large fish of the general appearance of a TORPEDO (*q. v.*) has been found in the Eocene of Monte Bolca; and Cyclobatis, from the Upper Cretaceous limestone of Lebanon, is probably another extinct representative of this family.

**Torpedo,** in ichthyology, the type genus of *Torpedinidæ*, with the characters of the family. There are six species distributed over the Atlantic and Indian oceans; three of these occur in the Mediterranean, and two, *T. marmorata* and *T. hebetans*, are sometimes found on the British coast. The electric organs consist of many perpendicular prisms, mostly hexagonal, the whole forming a kidney-shaped mass. Each column in the living fish appears like a clear trembling jelly. Hunter counted 470 of these columns in a specimen of *T. marmorata*, and says that the partitions between them are full of arteries, which bring the blood direct from the gills. These organs convert nervous energy into electricity. Each organ receives one branch of the trigeminal and four branches of the vagus, the former and the three anterior branches of the latter being each as thick as the spinal cord. The fish gives the electric shock voluntarily, to stun or kill its prey or in self-defense; but to receive the shock the object must complete the circuit by communicating with the fish at two distinct points, either directly or through the medium of some conducting body. The force of the discharge varies with the size and vigor of the fish; large and healthy specimens can inflict severe shocks sufficient to disable a man. The electric currents generated in these fish possess all the other known powers of electricity; they render the needle magnetic, decompose chemical compounds, and emit sparks. Also the common name of any individual of the genus. In Southern European waters the best known species is *T. marmorata*. It is dark brown in color, lighter round the eyes. Specimens have been taken weighing 100 pounds, but they usually average about half that weight, with the disk about 30 inches broad. *T. hebetans*, more rarely met with, is dark chocolate-brown above, white beneath. They are also called cramp fish and numb fish. A well-known American species is *T. occidentalis*.

**Torpedo,** a case filled with dynamite, gun cotton, or other high explosive, that may be exploded at the will of the con-



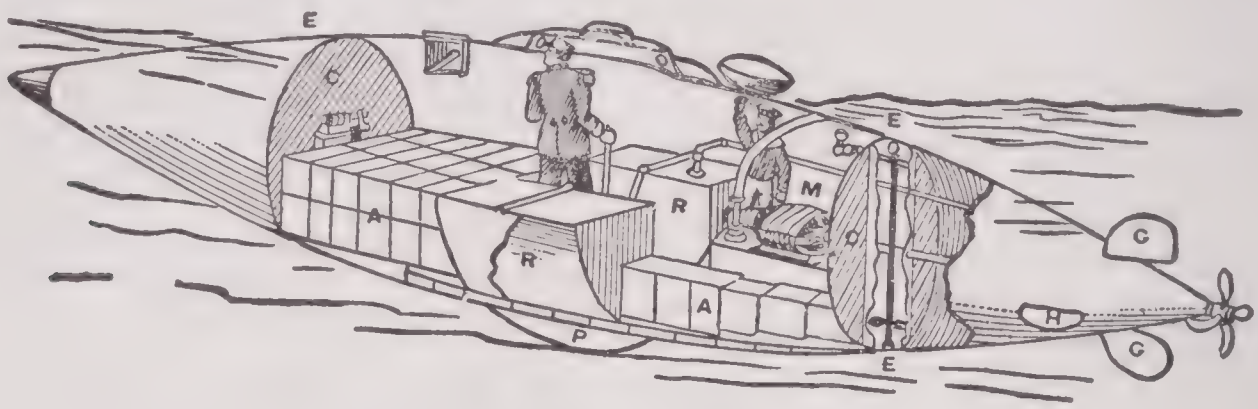
FIRING A TORPEDO FROM A WARSHIP.

trolling party, on land, in the air, or in the water, or by contact with the enemy's vessel. When torpedoes are of the movable kind they are called automobile torpedoes; those which are anchored or stationary are called mines, and may be either on land or in the water. When torpedoes are thrown through the air they are called aërial

torpedoes. These are the surest and most dangerous in their action, but have some drawbacks; there is only one kind of machine that has successfully projected aërial torpedoes and it must be so placed as to become a target for the enemy's fire. This is known as the Zalinski dynamite gun. Six of these guns are owned by the United States, three being mounted at Sandy Hook and three at the Presidio, San Francisco.

In this gun air is compressed by means of a steam engine into metallic cylinders. The projectile containing the gun cotton or dynamite in some form is placed in the gun and the air under high pressure is allowed to pass into the gun chamber by automatic cut-offs, that prevent waste as soon as the projectile has moved a certain distance down the bore. The compressed air thus forms a cushion that propels without dangerous shock the projectile containing the war vessel by means of compressed air. They travel with a velocity of 20 to 30 knots an hour for about 800 yards. The torpedo is exploded by its impact against the sides of a ship.. From 1877, when this torpedo first came into notice, till 1898, when the American-Spanish War broke out, there were only 12 instances where it was employed in actual warfare. In five cases the torpedo hit and destroyed the vessel at which it was aimed.

Among the automobile torpedoes is the Howell, which is sent out by means of a small discharge of gunpowder in side tubes connecting with the main tubes. The explosion compresses the long column of air in the side tubes, which gains admission to the main tube through ports in rear of the torpedo, and drives it forth without shock or noise or fouling from powder residuum. The driving force is a heavy steel fly wheel,




AN ELECTRIC TORPEDO BOAT.

A, storage batteries; C, bulkheads; E, vertical tubes, with horizontal propellers; G, rudders; H, horizontal fin; M, electric motor; R, water tanks; P, weight to be dropped in an emergency.

explosive. The guns are made of thin, long metallic tubes.

The largest charge that is usually thrown is 250 pounds of dynamite or gun cotton. This will tear to pieces any ship it strikes. The United States government conducted in 1901, a series of experiments with the GATHMAN GUN (*q. v.*), which used powder instead of compressed air to propel the dynamite torpedo; but finally refused to adopt the gun.

The Whitehead torpedo, which has been adopted by all the leading governments of Europe and is in general use in the United States navy, is a cigar-shaped projectile with a little propeller at one end. The shell or case is of metal, from 15 to 25 feet long and from 8 to 15 inches in diameter. It is divided into three compartments. The first contains the high explosive. The middle compartment is a strong air chamber with air under a pressure of 1,000 to 1,500 pounds to the square inch. The third or aft compartment contains the propelling apparatus, which is run by the air from the second. These torpedoes are shot from tubes either forward, aft or midships of a which is spun up preliminary to discharge to about 9,000 revolutions per minute. The wheel begins to revolve at this high momentum directly the torpedo is discharged. Its range is about the same as that of the Whitehead torpedo. The Harvey torpedo is constructed to be pulled through the water something in the fashion of a ship's log. It has been, however, superseded by the Brennan and other forms of maneuvered torpedo. Other types of torpedoes are the Sims-Edison, the Victoria, the Patric and the Nordenfeldt. Many plans have been devised to protect ships from torpedoes, but none seem more effective than the nets made of heavy metal which are suspended on booms from the ship's side when she is at anchor. When she is moving she throws out her own torpedoes which explode those in the channel ahead. For stationary torpedoes, see SUBMARINE MINES.

**Torpedo Boats,** small vessels built for speed and fitted with tubes for firing torpedoes by either compressed air or gunpowder. They are of two classes: those with powerful engines designed to steal on an enemy under cover of darkness, and

those which can be used on the surface or submerged to do their work unseen beneath the water. The first torpedo boat was built about 1873, by Thornycraft, of England, for the Norwegian government. This had a speed of 15 knots an hour, which has been raised in subsequent vessels of the kind to over 30 knots. The first of the present class of torpedo boats was built by Thornycraft in 1887, for the Spanish government. The torpedo boat destroyer does not differ essentially from the torpedo boat, except in its greater speed and its power, owing to its greater weight, to maintain that speed in the face of a considerable sea. Its armament is also heavier and its guns of longer range. In the American-Spanish War, Admiral Cervera had three torpedo boat destroyers in his ill-fated squadron and all were destroyed by the American ships, two of them, the "Pluton" and "Furor," at Santiago, by the converted yacht "Gloucester." See SUBMARINE NAVIGATION.

**Torpedo-boat Destroyer,** a torpedo boat of a most formidable kind, designed for the destruction of ordinary torpedo boats. The destroyers are usually armed with one 12-pounder gun and from three to five 6-pounder guns, besides their equipment of torpedoes, and carry a crew of four officers and about 40 men. They are capable of 30 knots an hour, and as they carry from 70 to 100 tons of coal, can make a voyage of 1,300 to 1,500 miles without recoaling. See TORPEDO BOATS.

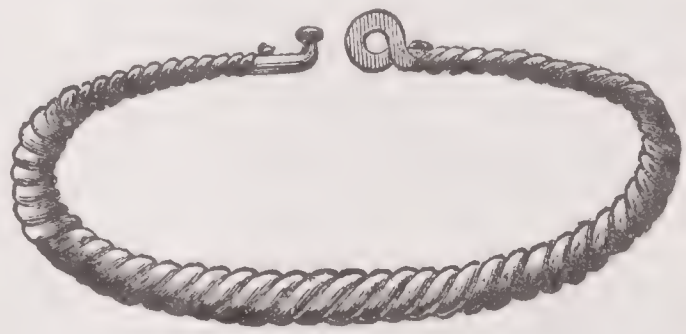
**Torpedo Drag,** a cable bearing grappling hooks to catch torpedoes. The ends of the cable are generally carried in boats which are propelled up and down the channel some distance apart Sometimes the drag rope is thrown ahead of a vessel by a shell from a small mortar, and is drawn in by the windlass.

**Torquatella,** in zoölogy, the sole genus (with a single species, *T. typica*), of the family *Torquatellidæ* founded on a specimen discovered by Prof. Ray Lankester at Naples. Body elongate-ovate, nearly twice as long as broad, rounded posteriorly; the anterior membranous frill highly expansile, its front margin abruptly truncate or emarginate, its surface obliquely plicate; dimensions unrecorded.

**Torquatellidæ,** in zoölogy, a family of *Peritricha;* animalcules free-swimming, without a lorica, more or less ovate; the anterior ciliary wreath replaced by a membranous extensile and contractile collar-like structure, perforated centrally by the oral aperture.

**Torquay,** a watering place of South Devon, England; occupying a cove on the N. side of Tor Bay, 23 miles S. of Exeter and 220 W. S. W. of London. Tor Abbey was founded here for Premonstratensian monks in 1196; and Tor Bay is famous in history as the place where in 1688 William of Orange landed at Brixham, and during the war with France was often used as a naval rendezvous. But till the beginning of the 19th century Torquay itself was little more than an assemblage of fishermen's huts. About that time the advantages of its climate — which are a peculiarly sheltered position, an equable temperature (mean 44° in winter, 55° in summer), and freedom from fogs — caused it to be resorted to by consumptive patients, and it soon acquired a European celebrity, which still is almost unrivalled. The romantic hills and valleys of Torquay and its environs have been overspread with terraces, villas, and gardens, the luxuriance of its foliage being a delightful feature of this "queen of English watering places." The scenery is as varied as it is beautiful, the geology of the district most interesting; and Kent's Cavern is only a mile distant. The remains of the abbey include some crypts and the 13th-century "Spanish barn" (so called from its having housed some survivors from the Armada); and St. Michael's Chapel, on a hilltop, is thought to have been connected with the abbey. St. John's Church, by Street, is a striking Early English edifice; and other buildings are the town hall (1852), museum (1875), and theater (1880). Torquay is a great yachting station; its chief industries are the working up of Devonshire marbles and the manufacture of terra-cotta. Pop. (1901) 33,625.

**Torque,** in archæology, a twisted collar of gold, or other metal, worn around the neck in ancient times by the people of Asia



TORQUE.

and the N. of Europe, and apparently forming a great part of the wealth of the wearer. Among the ancient Gauls gold torques appear to have been so abundant that about 223 B. C. Flaminius Nepos erected to Jupiter a golden trophy made from the torques of the conquered Gauls. The name of the Torquati, a family of the Manlian Gens, was derived from their ancestor, T. Manlius, having in 361 B. C. slain a gigantic

Gaul in single combat, whose torque he took from the dead body and placed on his own neck. Many examples of gold torques have been found in England and Ireland; the commonest form is that known as funicular, in which the metal is twisted, with a plain, nearly cylindrical portion at both ends, which are turned back in opposite directions, so that each end terminates in a kind of hook by which the torque was fastened. Bronze torques are, as a rule, thicker and bulkier in their proportions than those of gold, and the ends are usually left straight or but slightly hooked over so as to interlock

**Torqued,** in heraldry, wreathed, bent. (Said of a dolphin haurient, twisted into a form nearly resembling the letter S reversed.)

TORQUED.

**Torquemada, Thomas de,** the first inquisitor-general of Spain; born in Valladolid, Spain, in 1420. He became prior of a Dominician monastery at Segovia, and succeeded in persuading Ferdinand and Isabella to crave from the Pope the appointment of the "Holy Office" of the Inquisition. Torquemada was appointed its head, and began in 1483 that infamous work which has left his name a byword for pitiless cruelty. He has given a subject to Longfellow and to Hugo. He died in Avila, Spain, Sept. 16, 1498.

**Torre del Greco,** a town in Italy, situated on the Bay of Naples, seven miles S. E. of Naples. Its industries are fishing and coral working. It has been several times destroyed by earthquakes, and eruptions from Mount Vesuvius. Pop. (1901) 33,299.

**Torrefied Grain,** cereals such as barley, maize, rice, etc., which have been submitted for a short time to a relatively high temperature, by which the natural moisture of the grain is suddenly expelled, and in the act of escaping distends each corn to a greater or less extent. On a large scale it is prepared by heating the cereals in a rotating cylinder over a gas fire, and is used both for brewing purposes and for feeding cattle. Torrefied barley is sometimes called white malt.

**Torrens, Lake,** a large shallow salt lake of South Australia, about 90 miles N. of Spencer's Gulf. In the dry season it is merely a salt marsh.

**Torrens, William Erskine,** an American promoter; born in New York city, July 15, 1870; was educated in the public schools and afterward under private instructors. He then studied manufacturing methods and mill finance. In 1896 he was made foreign commissioner to South America for the National Association of Manufacturers of the United States and in 1897–1899 was a special commissioner for the same to foreign countries. He traveled in every country of the world studying the opportunities for introducing American manufactures into each. His publications include: "Commercial Traveling in South America" (1897); "Commercial Traveling in South Africa" (1898); "Commercial Traveling in the East"; etc.

**Torrens' Land System,** a plan of land transfer drawn up by Sir Robert Torrens, and by him put in operation in Australia. It is now used in all the Australian provinces, in Tasmania and New Zealand, and in British Columbia and Ontario, and has been attempted in various parts of the United States. Its object is to make the transfer of land as simple as that of bank stock, and render the title of the holder thereof as free from danger or difficulty as ordinarily the title of the holder of bank stock is to the shares he holds. A land registry is established under the control of an officer known as the master of titles, by whom all land transactions are registered. A title may be registered as absolute or possessory; if absolute, the title must be approved by the master of titles before the ownership can be registered in fee simple. The first registration of a person as owner with absolute title will vest in that person an estate in fee simple in the land, subject to any incumbrances that may be entered on the register. If a possessory title is required, the applicant is registered as owner on giving such evidence of title as may be prescribed. The registration of any person as first owner, with a possessory title only, will not interfere with the enforcement of any estate, right, or interest adverse to the title that may then exist or arise at a later date. Should it appear to the master of titles that an absolute title to any land can only be held for a limited period or subject to reservations, he may except from the effect of registration any estate, right, or interest arising before a specified date, or arising under a special instrument or otherwise particularly described in the register. A title granted under such conditions is to be called a qualified title. The master of titles must give to the first registered owner a "land certificate," and this certificate must say whether the title of the owner is "absolute," "qualified," or "possessory." An insurance fund is created to indemnify persons who may suffer loss through misdescription, omission, or other error in any certificate of title, or in any entry on the register. This fund is provided by laying a tax of one-fourth of 1 per cent. on the value of the land on the first certificate of title being granted, in addition to registra-

tion fees. The master of titles settles all questions as to the liability of the fund for compensation.

**Torrent,** a violent, rushing stream of water falling suddenly from high lands or mountains, where there have been heavy rains, or an extraordinary dissolution of snow; a violent, rushing stream of any other fluid, as of lava; a stream suddenly raised, and running rapidly, as down a precipice; as, a roaring torrent. Metaphorically, any violent or rapid flow, or strong current; as, a torrent of words.

**Torres Strait,** the strait which separates Australia from New Guinea, being about 80 miles across. It is crowded with islands, shoals, and reefs, rendering its navigation difficult.

**Torres Vedras,** a town of Portugal in the province of Estremadura; on the Sizandro, 30 miles N. of Lisbon; celebrated in connection with the famous lines of defense behind which Wellington retired after the vain effort to hold the Portuguese frontier against the French. The outermost of the lines stretched 29 miles from Alhambra on the Tagus to the sea at the mouth of the Sizandro; the second, from 6 to 10 miles behind, from Quintella on the Tagus to the mouth of the St. Lorenza, a distance of 24 miles. The third, much shorter, lay S. W. of Lisbon, at the very mouth of the Tagus, and was meant as a cover if embarkation were necessary. The whole lines consisted of 152 redoubts, with 534 pieces of ordnance and 34,125 men. The "great work at Monte Agraca" had a perimeter of 2,435 feet, an armament of 25 guns, and a garrison of 1,590 infantry. The Allies entered the retreat which the foresight of Wellington had provided in October, 1810, and held the French at bay till March, 1811. The enemy then retired, and Wellington issued on his career as the liberator of the Peninsula.

**Torrey, Bradford,** an American author; born in Weymouth, Mass., Oct. 9, 1843. He was educated in the public schools, taught two years, then entered business in Boston. In 1886 he became assistant editor of the "Youth's Companion." He was a close student of birds, and wrote largely on this subject for the magazines. His essays have been collected into the following volumes: "Birds in the Bush" (1885); "The Foot-Path Way"; "A Rambler's Lease"; "A Florida Sketch-Book"; "Spring Notes from Tennessee" (1896); "A World of Green Hills" (1898); etc.

**Torrey, John,** an American botanist; born in New York city, Aug. 15, 1796; was graduated at the College of Physicians and Surgeons; practised in New York city, devoting his leisure principally to the study of botany. He was assistant surgeon in the United States army, and acting Professor of Geology, Mineralogy, and Chemistry at the United States Military Academy in 1824–1828; and Professor of Chemistry at Princeton College in 1830–1854. He was one of the founders of the New York Academy of Science (under the name of the New York Lyceum of Natural History) in 1817, and president of the Torrey Botanical Club in 1824–1826 and in 1838. When the Geological Survey of New York was organized in 1836 he was made botanist, and held that post for several years. In 1860 he presented his herbarium, containing about 50,000 specimens, to Columbia College. His publications include "Catalogue of Plants growing spontaneously within Thirty Miles of the City of New York" (1819); "Report on the Flora of New York State" (2 vols. 1843); etc. He died in New York city March 10, 1873.

**Torrey, Joseph,** an American clergyman; born in Rowley, Mass., Feb. 2, 1797; was graduated at Dartmouth College in 1816 and at the Andover Theological Seminary in 1819, and was pastor of a Congregational church in Royalton, Vt., in 1824–1827. He was Professor of Greek and Latin in the University of Vermont in 1827–1842 and of Philosophy in 1842–1867, and president in 1862–1866. He was the author of a volume of lectures entitled "A Theory of Fine Art"; edited "Remains of President James Marsh," and "Select Sermons of President Worthington Smith"; and translated Meander's "General History of the Christian Religion and Church." He died in Burlington, Vt., Nov. 26, 1867.

**Torreya,** a genus of plants, order *Taxaceæ*, to which the name of stinking yews has been given, from the disagreeable smell given off by the leaves and wood when bruised or burnt. They are small evergreen trees of North America, China, or Japan, and grow from 20 to 50 feet high, with two-ranked linear or lanceolate leaves and diœcious flowers.

**Torrey's Peak,** a peak of the Rocky Mountains, in Colorado, 48 miles S. W. of Denver; height, 14,336 feet.

**Torricelli, Evangelista,** an Italian mathematician; born in Piancaldoli, Romagna, Oct. 15, 1608. He was brought up by an uncle who resided at Faenza, and who put him under the tuition of the Jesuits. When 20 years old he was sent to Rome, and there devoted himself to mathematical studies. Galileo's theories on force and motion engaged his attention, and led to his writing a "Treatise on Motion" (about 1641), and to his being invited by Galileo (1641) to visit him; on the old philosopher's death, three months afterward, he was appointed mathematician to the grand-duke, and professor to the Florentine Academy. His great discovery was

the interpretation of the previously known fact that water will rise in a suction pump only to the height of about 32 feet — the idea that the column of fluid is sustained by the pressure of the atmosphere on the open surface of fluid. The vacuum in the barometer is the Torricellian vacuum; and the barometer is sometimes called the Torricellian tube. Torricelli also effected the quadrature of the cycloid — in this he was anticipated by Roberval — and made other mathematical discoveries. To him is due the fundamental principles of hydromechanics; and he made and greatly improved both telescopes and microscopes. He died in Florence, Italy, Oct. 25, 1647.

**Torricellian Experiment,** the experiment by which Torricelli (in 1643) ascertained the exact measure of the weight of the atmosphere. A glass tube (now known as the Torricellian tube), about a yard long and a quarter of an inch internal diameter, is sealed at one end and filled with mercury. The aperture being closed by the thumb, the tube is inverted, the open end placed vertically in a small vessel of mercury, and the thumb removed. The column of mercury sinks till it comes to rest at a height which, at the level of the sea, is about 30 inches above the mercury in the trough, leaving a space in the tube which is called the Torricellian vacuum. The mercury is raised in the tube by the pressure of the atmosphere on the mercury in the trough. There is no contrary pressure on the mercury in the tube, because it is closed. But if the end of the tube be opened, the atmosphere will press equally inside and outside the tube, and the mercury in the tube will sink to the level of that in the trough. By this experiment Torricelli showed that the reason why water would rise in a suction pump to a height of only about 32 feet, was due to the pressure of the atmosphere on the open surface of the fluid.

**Torrid,** dried with heat; parched; as, a torrid desert. Burning; parching; intensely hot; as, a torrid climate. The torrid zone is the zone of the earth included between the tropics of Cancer and Capricorn. It extends from the equator, on both sides, to the parallel corresponding to the sun's greatest declination, about 23½°.

**Torrigiano, Pietro,** a Florentine sculptor; born in 1470. According to Cellini, he broke Michelangelo's nose in a quarrel; he served as a mercenary soldier, and went to England in 1509 to erect the tomb of Henry VII. and his queen, still in Westminster. He executed other works which were destroyed at the Reformation; and settling in Spain, died in the prison of the Inquisition, in 1522.

**Torrington,** a city in Litchfield co., Conn.; on the Naugatuck river; about 28 miles W. by N. of Hartford. It contains many churches, a high school, waterworks, electric lights, banks, and daily and weekly newspapers. Torrington has manufactories of woolen goods, hardware, plated goods, machinery, needles, etc., and an assessed property valuation of nearly $6,000,000. It was the birthplace of John Brown. Pop. (1900) 8,360; (1910) 15,483.

**Torrington, Viscount.** See BYNG, GEORGE.

**Torsion,** in mechanics, the force with which a body, as a thread, wire, or slender rod, resists a twist, or the force with which it tends to return to its original state on being twisted Such machines as capstans and windlasses, also axles, which revolve with their wheels, are, when in action, subjected to be twisted, or undergo the strain of torsion. If a slender rod of metal be suspended vertically, so as to be rigidly fixed at the point of suspension, and then twisted, through a certain angle, it will, when the twisting force ceases to act, untwist itself or return in the opposite direction with a greater or less force or velocity, till it comes to rest in its original position The limits of torsion within which the body will re turn to its original state depend on its elasticity, and the force with which it tends to recover its natural state is termed elasticity of torsion. This force is always proportional to the angle through which the body has been twisted. If a body is twisted so as to exceed the limit of its elasticity, its particles will either be wrenched asunder or it will take a set, and will not return to its original position on the withdrawal of the twisting force.

In surgery, the twisting of the cut end of a small artery in a wound or after an operation, for the purpose of checking hemorrhage. The bleeding vessel is seized by an instrument called a torsion forceps, drawn out for about a quarter of an inch, and then twisted round several times, till it cannot untwist itself.

**Torsion Balance,** an instrument employed to measure the intensities of very small forces. It consists of a fine wire, silk thread, or the like, suspended from a fixed point, and having a horizontal needle attached, the force being measured by the resistance to twisting which the filament exhibits when the force (that of attraction, for instance) acts on the needle.

**Torsk,** in ichthyology, *Brosmius brosme* (or *vulgaris*); a valuable food fish of the family *Gadidæ*, abundant in the N. parts of the Atlantic Ocean. It is from 18 inches to two, rarely three, feet long; head dusky, back and sides yellow, passing into white on the belly. It lives in deep water, and approaches the land early in the year to spawn among the seaweed on the coast. Its

flesh, when dried and salted, is generally considered to furnish the best stock fish, and forms a considerable article of trade.

**Torso,** an art term signifying the trunk of a statue of which the head and the extremities are wanting. The torso of Hercules, in the Belvedere at Rome, is considered by connoisseurs one of the finest works of art remaining from antiquity.

**Torstensson, Lennart,** a Swedish general in the Thirty Years' War; born in Torstena, Sweden, Aug. 17, 1603; became in his 15th year page to Gustavus Adolphus; and in 1630, as captain of the bodyguard, accompanied the king to Germany, where he highly distinguished himself in the battle on the Lech, April 5, 1632. He was taken prisoner before Nuremberg, Aug. 12, 1632, and subjected to rigorous confinement for six months in a subterranean dungeon at Ingolstadt by Maximilan of Bavaria, which shattered his health and obliged him to return to Sweden. In 1635 he returned to Germany, and took part in most of the battles under Bernhard of Weimar and Baner, the successors of Gustavus. In 1639 he returned to Sweden, but on the death of Baner in 1641 he became Commander-in-Chief of the Swedish army. After recruiting his army, he entered Schlesien through Sachsen, took Glogau and Schweidnitz, turned into Moravia and captured Olmütz. Obliged to retreat into Sachsen before the Archduke Leopold and Piccolomini, he turned on his pursuers and inflicted a severe defeat at Breitenfeld, Nov. 2, 1642. In the spring of 1643 he threatened Prague, and relieved the beleagured Olmütz. In consequence of Denmark's declaration of war against Sweden, in December he burst into Denmark, and in six weeks subjugated the whole peninsula, with the exception of the fortresses Rendsburg and Glückstadt. After defeating the Austrian general Gallas at Jüterbok, Nov. 23, 1644, he returned into Bohemia, defeated Katzfield at Jankau, March 6, 1645, overran Moravia, pressed forward to the Danube, and demolished the fortifications on the Wolfsbrücke before Vienna. He then laid siege to Brünn, but its obstinate defense, and a pestilence among his troops obliged him to retreat into Bohemia. Exhausted by sickness, he was obliged to leave the command to General Wrangel, and return to Sweden. He was made Count of Ortala by Christina in 1647, and died in Stockholm, April 7, 1651.

**Tort,** in law, denotes injustice or injury. Actions on torts or wrongs are all personal actions for trespasses, nuisances, assaults, defamatory words, and the like.

**Tortoise,** in zoölogy, a name formerly taken to include all the *Chelonians,* but now, unless qualified by an adjective, confined to the individuals of the family *Testudinidæ.* Tortoises, in the wider sense, are sluggish reptiles, long-lived, and extremely tenacious of life under adverse surroundings, and have survived from remote antiquity while higher animal types, formerly contemporaneous with them, have become extinct, and have been succeeded by very different forms. They have an osseous exoskeleton, which is combined with the endoskeleton to form a kind of bony case or box in which the body of the animal is inclosed, and which is covered by a coriaceous skin, or, more usually, by horny epidermic plates. The exoskeleton consists essentially of two pieces: a dorsal piece, generally convex (the carapac), and a ventral piece, usually flat or concave (the plastron), by some regarded as an abnormally developed sternum, while others consider the bones of which it is composed as integumentary ossifications. In the endoskeleton the dorsal vertebræ are immovably joined together, and have no transverse processes, the heads of the ribs uniting directly with the bodies of the vertebræ; the scapular and pelvic arches are placed within the carapace, so that the scapular arch is thus inside the ribs, instead of being, as it normally is, outside them. All the bones of the skull except the lower jaw and the hyoid bone, are anchylosed. There are no teeth, and the jaws are cased in horn, so as to form a kind of beak. Tongue thick, and fleshy; heart three-chambered, ventricular septum imperfect. The lungs are voluminous, and respiration is effected by swallowing air. All will pass prolonged periods without food, and will live and move for months after the removal of the entire brain.

The most familiar example of true or land tortoises is the dry land terrapin of the Southern States (see TERRAPIN). Like all the members of the family, it has a buckler covering its back, and another beneath the abdomen, which together are called the shell; they are united and solid, and have openings in front and behind for the neck, limbs, and tail. The tortoise crawls very slowly, withdrawing its head and limbs within the shell when alarmed, and remaining passive till the danger has passed. It is found in the countries bordering on the Mediterranean, and is said to range as far N. as Switzerland and the S. of France. It is about 12 inches long; the scales are granulated in the center, streaked on the margins, and spotted or marbled with black and yellow. It is of this species that White has left such an interesting account, and subsequent investigations have confirmed the accuracy of his observations. He says: "It retires underground about the middle of November, and comes forth again about the middle of April. When it first appears in the spring it discovers very lit-

tle inclination toward food; but in the height of summer grows voracious; and then as the summer declines its appetite declines; so that for the last six weeks it hardly eats at all. Milky plants such as lettuces, dandelions, sowthistles, are its favorite dish. In a neighboring village one was kept till by tradition it was supposed to be 100 years old." The succulent vegetable diet is common to the whole family, and all but the tropical species hibernate. The Greek tortoise is an article of food in the S. of Europe, and the flesh of all the species appears to be good, while their eggs are regarded as delicacies. But the most interesting forms are gigantic tortoises formerly found in great numbers in the Mascarene and Galapagos Islands. When discovered these islands were uninhabited by man or any large wild animal; the tortoises therefore enjoyed perfect security, and this, joined to their extraordinary longevity, accounts for their enormous size and their vast number. They can be readily recognized by the black shell, the thinness of the bony carapace, and by the absence of the front plate, allowing the long neck to be raised up and carried above the level of the body. Five species of this group are known, and two of them, *Testudo elephantina*, the gigantic land tortoise of Aldabra, and *T. abingdonii*, the Abingdon Island tortoise, grow to enormous size. A specimen of the first named weighed 870 pounds, and though known to be more than 80 years old, was still growing at the time of its death.

In military terms, a method of defense, used by the ancients, formed by the troops arranging themselves in close order and placing their bucklers over their heads, making a cover resembling a tortoise shell; a TESTUDO (*q. v.*).

**Tortoise Plant,** in botany, *Testudinaria elephantipes;* resembles the yam in its netted leaves and its flowers; but while the yam bears its thin-skinned tubers underground, the tortoise plant has its huge rootstocks or rhizomes above ground. They are globular, and sometimes four feet in diameter, with a soft corky bark, which after a time cracks, so as to produce protuberances; its aspect being supposed to resemble the back of a tortoise, whence its Latin and English names. The stems, which are 40 feet high, rise from the rootstock, bearing entire leaves, with small, greenish-yellow flowers in their axils. It grows at the Cape of Good Hope.

**Tortoiseshell,** a popular name for the partial or entire outside covering of the carapace and plastron present in many of the *Chelonia*. It is in the form of thin plates, united together at their edges, and corresponding, to a certain extent, with the underlying bones of the shell. The number, size, position, coloring, and ornamentation of these plates differ greatly even in genera and species. Also, the name given to the horny epidermic plates of *C. imbricata*, the hawk's-bill turtle. The largest of these plates are about 18 inches long by 6 broad, and rarely exceed one-eighth of an inch in thickness. Tortoiseshell is semi-transparent, and mottled with various shades of yellow and brownish-red. Its value depends on the brightness and form of the markings, and, if taken from the animal after death and decomposition, the color of the shell becomes clouded and milky. Hence the cruel expedient is resorted to of seizing the turtles as they repair to the shore to deposit their eggs, and suspending them over fires till the heat makes the plates on the dorsal shields start from the bone of the carapace, after which they are permitted to escape to the water. But, according to the "Journal of the Indian Archipelago," "dry heat is only resorted to by the unskillful, who frequently destroy the tortoise shell in the operation. At Celebes, whence the finest tortoiseshell is exported to China, the natives kill the turtle by blows on the head, and immerse the shell in boiling water to detach the plates." Tortoiseshell is used for making combs, snuff boxes, and many fancy articles; as a material for inlaying ornamental furniture; as a veneer, and as a ground substance in which the precious metals and mother-of-pearl are inlaid. It becomes soft at a temperature of 212°, and retains when cold any form given to it when in a plastic state. Pieces can also be joined together by the pressure of hot irons. Tortoiseshell is now successfully imitated by stained horn and by a composition of gelatine with various metallic salts. The Indian islands furnish the largest supply for the European and Chinese markets, the chief seats of the trade being Singapore, Manila, and Batavia, from which are exported yearly about 26,000 pounds, of which Singapore sends about a half.

**Tortoiseshell Butterfly,** the name given to two butterflies. The small tortoiseshell, *Vanessa ulticæ,* one of the commonest of butterflies, is of a bright red brown, and has on its costal margin three large black spots, beyond the third of which is a white one. The space between the first and third spots is yellow. Larva with 11 spines, its color yellowish-gray, with lines and stripes of black, brown, and yellow; it feeds on the nettle. The large tortoiseshell, the larva of which feeds on the elm, is much rarer. It is deep fulvous, with a broad, dark border. It has no white spot on the costa of the fore wings.

**Tortola,** a British West Indian island, chief of the Virgin Islands; area, 26 square

miles. It is bare and rugged, rising to a height of 1,600 feet. It contains Roadtown, the capital of the group.

**Tortricidæ,** in entomology, leaf rollers; the typical family of *Tortricina*. Anterior wings broad, the costa arched, but not folded. Larvæ rolling up or uniting leaves, and feeding within the sheath, tube, or case thus formed. In zoölogy, a family of innocuous colubriform snakes, with three genera, one of which (*Cylindrophis*) ranges from India through the Malay Islands, while *Charina* is found in California, British Columbia, and *Tortrix* in tropical America. Body cylindrical, scales smooth; tail conical, stumpy; head short and indistinct; they have a rudimentary pelvis with horny spines projecting close to the vent, and there are vestiges of the hind limbs.

**Tortricina,** in entomology, a tribe of *Heterocera*, with nine families and 299 species. Antennæ setaceous, much longer than the thorax; body moderately thick, with the apex blunt; the anterior pair of wings somewhat truncate behind; the posterior pair trapezoidal, unmarked. Larvæ with 16 legs.

**Tortricodes,** in entomology, the sole genus of *Tortricodidæ*. Anterior wings more than twice as long as wide; costa in the male nearly straight, in the female arched at the base. Only known species, *T. hyemana*, a moth with semi-transparent wings, grayish brown, with a darker blotch and fascia. It is abundant in oak woods.

**Tortrix,** in entomology, the typical genus of *Tortricidæ*. Palpi longer than the head, fore wings about twice as long as broad, costa arched abruptly at the base. A very common and pretty species is *T. viridana*, the green oak moth, the fore wings of which are pale green, the costal ridge sulphur-yellow, the hind wings gray. The larva, which is green with a brown head, feeds on the oak and hornbeam, etc., in May and June, and the perfect insect abounds on the oak in July. *T. ribeana* and *T. corylana* are also not uncommon. In zoölogy, the type genus of *Tortricidæ*, with one species, *T. scytale*, from Guiana. It lives above ground in boggy places, preying on worms, insects, and small reptiles. It is known as the coral snake.

**Torture,** the infliction of pain. It has been largely used in many countries as a judicial instrument for extracting evidence from unwilling witnesses, or confessions from accused persons, and in the despotisms of the East is still so used; the callousness of torturers and tortured being almost equally remarkable. In ancient Athens slaves were regularly examined by torture. Under the Roman republic only slaves could be tortured; under the empire torture, besides being much used in examining slaves, was occasionally inflicted even on freemen, to extract evidence of the crime of *læsa majestas*. Cicero and other enlightened Romans wholly condemned its use. Till the 13th century torture seems to have been unknown to the canon law; about that period the Roman treason law began to be adapted to heresy, the notions on which the ordeal was based contributing to promote its use. At a later period torture came to be largely employed by the Inquisition, and it was only in 1816 that it was prohibited by a papal bull. Its use was universal in the witchcraft trials, and accounts for the strange uniformity in confessions.

From the civil law torture became a part of the legal system of most European countries. It was adopted early, and to a large extent, by the Italian municipalities. In Germany elaborate apparatus for its infliction existed, not merely in the dungeons of the feudal castles, but in the walls beneath the town halls of Nuremberg and Ratisbon. Horrible tortures were constantly inflicted in the 16th and 17th centuries; the "second degree" included crushing the thumbs, feet, or head in iron apparatus, and the "third degree" burning the sides, arms, and finger nails with fire or red-hot irons and pincers. Torture continued to be practised in many of the prisons of Germany when they were visited by Howard in 1770; but in Prussia it was abolished in 1740–1754, and the example of Frederick the Great contributed greatly to its final suppression. In Hanover it was not formally abolished till 1840. The torturing of prisoners was carried to a great height in the Low Countries under Philip II. Savonarola and Galileo are among famous men who suffered torture. In France it was part of the judicial system till 1789, and in Scotland it was still in frequent use after the Restoration, and was only abolished in 1708. Torture in its most pitiless form was a characteristic feature of the atrocious Templar trials in France. Among enlightened men who denounced the worthlessness of confessions secured by torture Bayle, Thomasius, Voltaire, and Beccaria deserve mention. In Naples torture was in use in 1860.

The use of torture seems always to have been repugnant to the genius of the law in England; though occasionally used by an exercise of prerogative, it may be doubted whether it was ever recognized as lawful in the ordinary course of the administration of justice. It was employed by royal warrant in the Templar trials (1310), and we are told that till that time it was unknown in England. During the Tudor period the Council assumed the power of directing torture warrants to the lieutenant of the Tower, and other officers, against State prisoners, and occasionally also against per-

sons accused of other serious crimes; and similar warrants were at times issued under the sign-manual. Under James I. and Charles I. torture was less resorted to, and only in State trials. In 1628, in the case of Felton, the assassin of the Duke of Buckingham, the judges declared the examination of the accused by torture, for the purpose of discovering his accomplices, to be illegal. Torture was inflicted in England as late as 1592, in the case of the Jesuit Southwell in 1640 on Archer, who took part in an attack on Laud's palace, and as late as 1646 on witches. As late as 1806 Sir Thomas Picton was tried for having, as governor of Tobago, permitted a woman to be tortured under old Spanish laws. Torture is now disused in all countries of Europe, and is universally acknowledged to have been a most unsatisfactory mode of getting at the truth; often leading the innocent, from weakness, to plead guilty to crimes they had not committed.

The instruments of judicial torture have been various. The most celebrated is the rack, the boot, and thumbscrew. More ingenious instruments were such as the Scavenger's Daughter (rather "Skeffington's Daughter," from a lieutenant of the Tower under Henry VIII.), a spiked iron frame, which closed its victim in a deadly embrace. The PEINE FORTE ET DURE (*q. v.*) was a terrible torture. From torture for the sake of extracting evidence must be distinguished cruel punishments and modes of putting to death by lingering tortures — mutilation, breaking on the wheel, burning at the stake, disembowelling, etc. Notable instances of such were the tortures inflicted on the murderers of James I. of Scotland in 1437; on Damiens, the would-be assassin of Louis XV. in 1757; and on Jean Calas in 1762. Prison discipline was formerly little short of torture, including the use of bilboes and other dreadfully heavy irons; as also was the management of the insane; and the school punishments of comparatively recent times would now be regarded by many as falling under the same head. The marvellous collection of instruments of torture (including the "Iron Maiden," resembling the "scavenger's daughter") once used with hideous effect, and long on show as curiosities in Nuremberg, was bought by Lord Shrewsbury, and exhibited in London in 1891.

**Toru Dutt,** a young Christian Hindu girl of extraordinarily precocious genius; born in Calcutta, India, March 4, 1856; studied French and English literature with avidity; spent the years 1869–1873 in England and France; and at 18 published a critical essay of strange maturity on Leconte de Lisle, with translations into English verse. She next gave herself to Sanskrit, and translated several portions of the "Vishnupurana" into English blank verse. In 1876 she published "A Sheaf Gleaned in French Fields," being English translations of about 200 French poems. A romance which she had written in French, "The Diary of a Girl of Antwerp," was published at Paris in 1879, with a study by Mdlle. Clarisse Bader. Finally her "Ancient Ballads and Legends of Hindustan" was published at London in 1882, with a memoir by E. W. Gosse. She died Aug. 30, 1877.

**Torula,** in botany, the typical genus of *Torulacei.* Spores in beaded chains, simple, readily separating, placed on a short, continuous, or separate pedicel. Microscopic fungals causing moldiness. *T. casei* is cheese mold. *T.* (or *Saccharomyces*) *cerevisiæ* is the cause of fermentation when yeast is brought in contact with saccharine matter. That this is so is proved by the fact that fermentation is prevented by passing the yeast through a fine filter which strains out the torulæ, or by boiling either the yeast or the saccharine fluid, and then keeping it from air, except what has been passed through cotton-wool, which prevents them reëntering it from the atmosphere in which they are believed to be continually floating about in a dry state. A torula is about .0003 of an inch in diameter. It consists of a cell, generally containing a vacuole, but not a nucleus. Sometimes the cells are single, at others they are in heaps or strings. Their ordinary mode of reproduction is by budding.

**Tory,** a political party name of Irish origin, first used in England about 1679, applied originally to Irish Revolutionary Catholic outlaws, and then generally to those who refused to concur in the scheme to exclude James II. from the throne. The nickname, like its contemporaneous opposite Whig, in coming into popular use became much less strict in its application, till at last it came simply to signify an adherent of that political party in the State who disapproved of change in the ancient constitution, and who supported the claims and authority of the king, church, and aristocracy, while their opponents, the Whigs, were in favor of more or less radical changes, and supported the claims of the democracy. In modern times the term has to some extent been supplanted by Conservative.

**Tosca Rock,** in geology, the name given to the inhabitants of Buenos Ayres to a hard, cavernous, marshy, arenaceous rock, imbedded in layers and nodular masses among the argillaceous earth or mud of the pampas. It constitutes part of the Pampean formation, and is probably of Pleistocene age. The adoption of the local term tosca by Darwin has given it general currency.

**Tosti, Francesco Paolo,** an Italian composer; born in Ortona, Italy, April 9, 1846. He was famous as a composer of songs in Italian, French, and English; among his best-known ballads being "For Ever and For Ever" and "Beauty's Eyes." In 1875 he went to London and in 1880 was appointed singing teacher to the royal family. He wrote the operas, "The Grand Duke"; "The Prima Donna"; etc.

**Tosti, Ludovico,** an Italian church historian; born about 1800. He was a Benedictine monk, and wrote: "History of Monte Cassino"; History of Boniface VIII.," in which that Pope is defended against the accusations of Dante; "Abelard and His Time"; "The Countess Matilda and the Roman Pontiffs"; "The Lombard League," a spirited account of the struggle of the Italian communes with the German emperors; "History of the Council of Constance"; "History of the Greek Schism"; "Prolegomena to a Universal History of the Church" (2 vols). He died in 1866.

**Totaninæ,** in ornithology, a sub-family of *Scolopacidæ*. Bill straight or slightly curved upward, with groove as far as or beyond middle, nostrils very narrow; hind toe rather long and slender, barely reaching the ground; the toes in front joined by a membrane.

**Totanus,** in ornithology, a genus of *Scolopacidæ*, or, if that family is divided, of *Totamnæ*, with 12 species universally distributed. Bill slightly curved at tip, groove half the length of the bill; wings with first quill longest; tarsi with very narrow scales in front. *T. hypoleucus* (the common sandpiper or summer snipe), *T. macularius* (the spotted sandpiper), *T. ochropus* (the green sandpiper), *T. glareola* (the wood sandpiper), *T. calidris* (the common redshank), *T. fuscus* (the spotted redshank), *T. flavipes* (the yellow-shanked sandpiper), and *T. glottis* (the greenshank) are the most familiar species.

**Totem,** a natural object, one of a class taken by a tribe, a family, or a single person, and treated with superstitious respect as an outward symbol of an existing intimate unseen relation. The totem is considered as helpful to the man, who in his turn abstains from killing it if an animal, or eating it if a plant, and who often assimilates himself to it by wearing its skin or the like, or tattooing its picture on his body. The whole members of the clan who have a totem in common count themselves of one blood, and claim the totem as their common ancestor. The restriction on killing and eating it is absolute, and sometimes men are tabooed from touching or even looking at it under pain of death or expulsion from the tribe. Elaborate ceremonies connected with birth, marriage, and death point more closely to the identification of the man and the totem, and such ceremonies as those of the Australians at puberty are intended to initiate the youth into the restrictions that must be observed in sexual commerce.

In Australia also we find special sex-totems, which it is forbidden the opposite sex to kill; and among the North American Indians special personal totems — *manitous* —which are usually revealed after the exhaustion of the long fast at puberty. Totemism thus forms the foundation of a vast social system of alternate obligation and restrictions, for a man may not touch a woman of the same totem as himself. Sometimes the prohibition only extends to a man's own totem clan, but more frequently it includes several clans, in none of which is it allowed to marry. Such an exogamous group of clans within the tribe is a phratry, which was no doubt originally itself a totem clan that had since undergone subdivision. In Australia we find not infrequently a tribe divided into two phratries, each including a number of totem clans; sometimes subphratries again come between the phratries and the clans, still further by vexatious restrictions curtailing the liberty of marriage. The allowable range of kinship may stretch over 1,000 miles, and the native by no means needs spoken language to discover the women with whom he may have commerce, for the totem marks upon their bodies give him the plain indication of duty. J. F. McLennan, in his inquiry into the origin of exogamy, concluded that it was based on an antecedent system of totemism, evidence of which was generally found in all rude societies acknowledging kinship through women only, the same association being found almost as generally in those rude societies which know kinship through males, while the worship of plants and animals in more advanced societies acknowledging kinship, through males was lineally descended from totemism. Donald McLennan (preface to "The Patriarchal Theory," 1885) tells us that his brother had come to abandon his original theory as to the origin of totemism, and that, in the final constructive work to have been completed had he lived, his aim was to have been rather to show its prevalence, to establish some leading points in its history, to exhibit it in connection with kinship and with exogamy, and to make out its connection with worship. He tells us, further, that the general conclusion appeared to his brother to be that it was possible to demonstrate that, totemism preceding exogamy, the latter must have arisen in societies acknowledging no kinship save through women; that all other facts bearing on rude society may

be interpreted as evidence of a gradual progress from the condition of which totemism and female kinship are the mark; and that thus it was possible to exhibit the history of human society as that of an evolution moving with very various rapidity among different populations, but always beginning with a condition in which the idea of incest did not exist, and always tending upward from that condition. Whether or not this lowest step in the argument may be accepted — and grave objections enough will be found conveniently grouped in chap. xiv. of Westermarck's "History of Human Marriage" (1891) — the want of Mr. McLennan's book is a loss to the science of sociology that will not soon be made good.

**Totnes,** a municipal borough and market town of Devonshire, England, pleasantly situated on the slope of a steep hill on the right bank of the Dart; 29 miles S. S. W. of Exeter and 24 E. N. E. of Plymouth. The Dart is navigable to this point for vessels of 200 tons, and Brut the Trojan is fabled to have landed here; the "Brutus Stone," on which he first set foot, may be seen in the main street. At least, Totnes is a place of great antiquity, and retains two gateways, remains of the walls, a quaint guildhall, a good many antique houses, and an interesting Perpendicular church (1432; restored by Scott, 1874), with a noble red sandstone tower and a fine stone screen. The Norman castle of Judhael de Totnes, that crowns the hilltop, is represented by the circular shell keep. There is a grammar school (1568); and on the "Plains," near the river, stands a granite obelisk to the Australian explorer Wills, who was a native, as also was the Hebraist Kennicott. The borough was incorporated by King John. Pop. (1901) 4,035.

**Totten, Charles Adelle Lewis,** an American military officer; born in New London, Conn., Feb. 3, 1851. He was a graduate of the United States Military Academy, and for a number of years Professor of Military Tactics at Yale University. He wrote: "Strategos, the American War Game" (1880); "Important Questions in Metrology" (1883); "Yale Military Lectures"; "Nativity, its Facts and Fancies" (1887). His writings later became devoted to questions of Biblical prophecy. Died in 1908.

**Totten, Joseph Gilbert,** an American military officer; born in New Haven, Conn., Aug. 23, 1788; was graduated at the United States Military Academy in 1805 and commissioned 2d lieutenant of engineers. In 1808–1812 he had supervision of the construction of Castle William and Fort Clinton in New York harbor. He was chief engineer of the army on the Niagara frontier during the War of 1812. In recognition of his service at Plattsburg in 1814 he was promoted lieutenant-colonel and chief engineer of the United States army in 1838. About the same time he became supervisor and inspector of the United States Military Academy and discharged the latter duties till his death. When the war with Mexico broke out he was given charge of the engineering operations, and planned the siege of Vera Cruz, in recognition of which he was brevetted Brigadier-General. After the outbreak of the Civil War he was chief of the engineer bureau in Washington. General Totten translated from the French "Essays on Hydraulic and other Cements" (1842) and was the author of many papers on military and civil engineering. He died in Washington, D. C., April 22, 1864.

**Toucan,** in ornithology, the popular name of any bird of the genus *Rhamphastos*, often applied to the whole family *Rham-*

THE TOUCAN.

*phastidæ*. They are all natives of tropical America, and are easily distinguished by their enormous bill, irregularly toothed along the margin of the mandibles. All the species live in pairs in the shade of the forests, occasionally congregating in small parties, but never approaching the human habitations. In the true toucans the ground color of the plumage is generally black; the throat, breast, and rump adorned with white, yellow, and red; the body is short and thick; tail rounded or even, varying in length in the different species, and capable of being turned up over the back when the bird goes to roost. Toucans have been described as carnivorous; in captivity they will readily devour small birds, but probably in a state of nature their diet consists almost exclusively of fruit. They are remarkable among birds for a regurgitation of food, which, after being swallowed, is brought up to undergo mastication, an operation somewhat analogous to the chewing of

the cud among ruminants. They are easily tamed, and bear confinement well, even in cold climates.

**Toucana,** a small, circumpolar constellation, situated on the Antarctic Circle, nearly opposite to *Crux australis,* in relation to the South Pole the intervening space between the two constellations being nearly devoid of stars. It contains nine visible stars, the largest, Alpha Toucanæ, being only of the third magnitude.

**Touch,** in fine arts, the peculiar handling usual to an artist, and by which his work may be known. In music, the resistance made to the fingers by the keys of a pianoforte or organ. Also, the peculiar manner in which a player presses the keyboard, whether light, pearly, heavy, clumsy, firm, etc. In obstetrics, the examination of the mouth of the womb by actual contact of the hand or fingers.

In physiology, the sense through which man takes cognizance of the palpable properties of bodies. In a wide application, it is sometimes called the general sense, because by it we become conscious of all sensory impressions which are not the objects of smell, sight, taste, or hearing, which are called the special senses; even these, however, are held by modern biologists to be highly specialized forms of touch, which is often called the "mother of all the senses." In a more limited application, touch is applied to that modification of general sensibility which is restricted to the tegumentary surface or to some special portion of it, and which serves to convey definite ideas as to the form, size, number, weight, temperature, hardness, softness, etc., of objects brought within its cognizance. These sensations are received by the terminations of the cutaneous nerves, and thence conveyed to the brain. The sense of touch is distributed over the surface of the body, but is much more acute in some parts than in others, *e. g.,* in the hand. It is also capable of great improvement and development; and the blind, who have to depend largely on the sense of touch for guidance, acquire extraordinarily delicate and accurate powers of perception with the fingers; difference of form, size, consistence, and other characters, being readily recognized that are quite inappreciable to those who possess good vision, without special education.

In comparative physiology, the lower anthropidæ have both the hands and feet thickly set with tactile papillæ, and the surface of the prehensile tail which some possess is furnished with them in abundance. Other organs of touch exist in the vibrissæ, or whiskers, of the cat, and of certain rodents. In the Ungulata, the lips and nostrils are probably the chief seat of tactile sensibility, and this is especially so with the Proboscidea. In birds, tactile papillæ have been discovered in the feet, and they are also present in some lizards. A papillary apparatus appears to be absent from serpents, chelonians, and fishes, though in many of these its want is compensated by tentacles, having a high degree of sensibility. Descending still lower in the scale of animal life, organs of touch are found in the tentacles of the Cephalopoda and Gasteropoda, the palpi and antennæ of insects and the palpi of the Arachnida.

**Touchard-Lafosse, G.,** a French author; born in La Châtre in 1780. Among his very numerous writings are: "Political Puppets" (5 vols. 1829); "Chronicles of the Œil-de-Bœuf" (8 vols. 1829–1833), a collection of scandalous anecdotes; "Jean Angot: A Story of the 16th Century" (1835); "Chronicles of the Opera" (1854); "Recollections of Half a Century" (6 vols). He died in Paris in 1847.

**Touchneedle,** a small bar composed of an alloy of gold and silver, gold and copper, or of gold alloyed with a proportion of both metals, employed in assaying by the touchstone. A number are employed; one being of pure gold, a second composed of 23 gold and 1 copper, a third of 22 gold and 2 copper, and so on; these are rubbed upon the stone, and the color of the streak compared with that made by the metal to be tested. A further means of comparison is afforded by moistening the streaks with nitric acid, or by heating the stone. Silver is similarly tested by touchneedles composed of lead and silver.

**Touchpaper,** paper steeped in saltpeter, which burns slowly, and is used as a match for firing gunpowder, etc.

**Touchstone,** a variety of extremely compact siliceous schist, used for ascertaining the purity of gold and silver. Known also as black jasper and basanite. It was called Lydian stone, or lapis Lydia, by the ancients, because found in Lydia in Asia Minor. A series of needles (called touchneedles) of which the composition is known are used for comparison with the article to be tested. When the color of the streak produced by both the needle and the trinket on the stone is the same the quantity of alloy they contain is supposed to be similar.

**Touchwood,** a soft white substance into which wood is converted by the action of such fungi as *Polyporus igniarius.* It is easily ignited, and continues to burn for a long time like tinder.

**Toul,** a town of France, department of Meurthe-et-Moselle, on the Moselle, 12 miles W. of Nancy. It is strongly fortified, and has a fine Gothic cathedral, completed in the 15th century. Toul was taken in the Franco-German War after a siege of five weeks, Sept. 23, 1870.

**Toulon,** a French naval arsenal of the first class, in the department of Var; beautifully situated on a deep inlet of the Mediterranean, formed by the peninsula of Sépet; 40 miles S. E. of Marseilles. It is built at the foot of the Pharon Hills, which protect the city on the N., and are partly covered with fine forests. Defended by a strong citadel, girt with a double-bastioned wall, and surrounded by some 12 forts and redoubts, it is, next to Brest and Cherbourg, the principal naval station of France. The town is divided into old and new parts, the former quaint and dingy, the latter containing the public buildings erected by Louis XIV. and several spacious squares, as the Champs de Battaile, Puget, and St. Pierre. Among the chief buildings are the Hôtel de Ville with cariatides by Puget, the Hôtel de l'Intendance, the cathedral of St. Marie-Majeure, dating from the 11th century, but greatly altered, a naval hospital erected by Louis XIV., the hospital of St. Mandrier, on the Sépet, a public library, and a handsome theater. The Mourillon tower, built 1848, in six *étages,* commands a magnificent view. The Bagne for convicts, established by Colbert in 1682, was removed in 1872. The *port militaire,* one of the largest in Europe, comprises the old Darsa, formed under Henri IV., the new under Louis XIV., and the Darsa of Castigneau; three repairing docks and three arsenals: (1) The *arsenal maritime,* built by Vauban, with a general magazine, a cordage factory, a foundry, a naval museum, a park of artillery, and an armory. (2) That of Castigneau (area 17 hectares), with bakeries, copper works, forges, etc. (3) That of Mourillon, with steam sawmills, covered slips, and large fosses for the conservation of timber. The naval port, the equipment of which is singularly complete, and the cost of which amounted to upward of 160,000,000 francs, is separated from the roadstead by hollow bomb-proof moles, lined with batteries. A great number of the inhabitants (some 10,000) are employed in the arsenal works, and of recent years there has sprung up a considerable trade with Algeria. Toulon has an agreeable climate; at its Jardin des Plantes palms grow in the open air. Toulon is said to have been founded by a Roman soldier, Telo Martius, and was known as Telo in the 4th century. It was destroyed by the Arabs in 889, and again in the 12th century, but in the 16th century it had become a stronghold of some importance. On Aug. 27, 1793, it was taken by the English, who were forced on Dec. 19 following to surrender it to the Republicans after firing the shipping. Napoleon, a simple officer of the *Hommes sans peur,* then first evinced his genius for war. Pop. (1906) 103,549.

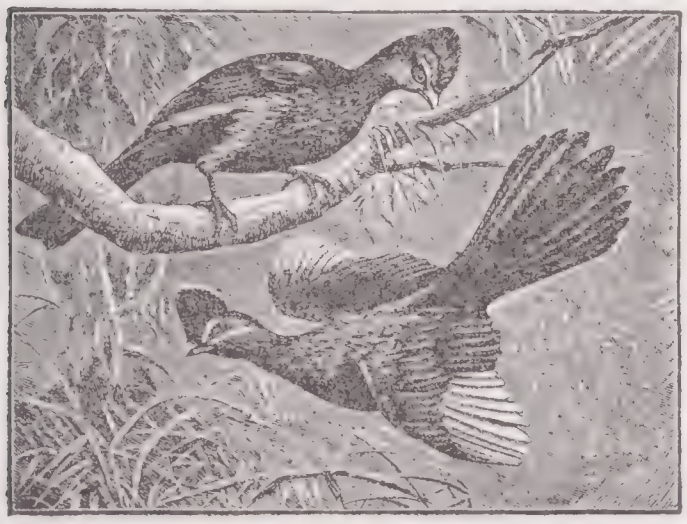
**Toulouse,** a city of France, the capital anciently of Languedoc, and now of the department of Haute-Garonne; 160 miles S. E. of Bordeaux and 466 S. by W. of Paris. It is situated in a broad and pleasant plain, on the right bank of the Garonne river, with the Canal du Midi sweeping round its E. and N. sides. The Garonne is crossed here by a beautiful bridge (1543–1626), nearly 300 yards long, which connects Toulouse with the suburb of St. Cyprien. The city, with the exception of the S. faubourg, is not particularly handsome (though the broad quays have rather an imposing appearance), nor has it many fine public buildings. One may note, however, the cathedral, containing the tombs of the Counts of Toulouse; the *Capitole,* or town hall (1769); the church of St. Sternin (11th to 15th century); and the Musée, with its interesting collection of antiquities, forming an almost uninterrupted chain in the history of art, from the Gallo-Roman to the Renaissance period. Toulouse is the seat of an archbishop, has a university academy, an academy of "floral games" (Société des Jeux Floraux), claiming to date from a troubadours' contest in 1323, academies of arts, sciences, antiquities, etc., schools of law, medicine, and artillery, an observatory, botanic garden, and a public library of 60,000 volumes. Toulouse manufactures woolens, silks, leather, cannon, steam engines, tobacco, brandy etc., and carries on a great trade with Spain. Its liver and truffle pies are celebrated throughout the S. of France. Pop. (1906) 149,438.

Tolosa was, in Cæsar's time, a city within the limits of the Roman *provincia,* and had been originally the capital of the Volcæ Tectosages, a Gallic tribe noted for its wealth and consequence. Under the empire its importance continued. Ausonius describes it as surrounded by a brick wall of great circuit, and so populous that it had founded four colonies. In A. D. 412 the Visigoths made it the capital of their kingdom; and after the time of Charlemagne it was under the sway of counts, who made themselves independent about 920, but in 1271 the "county of Toulouse" was reunited to the crown of France by Philippe le Hardi. Its literary celebrity reaches as far back as the Roman empire. Ausonius speaks of the *toga docta* of "Palladian" Tolosa, and the favorite deities of the city were Jupiter, Minerva, and Apollo. At a neighboring village a multitude of cinerary urns, statuettes, Phœnician, Celtiberian, Gallic, Greek, and Roman medals, fragments of buildings, and an entire paved street have been discovered. Early in the Middle Ages, under the Counts of Toulouse, it became a seat of Provençal poetry, and it suffered terribly in Simon de Montfort's crusade against the Albigenses. The Parliament of Toulouse had a great reputation, but unhappily it is likely to be remembered by one of its most

iniquitous decisions, that delivered in the case of the Calas family. In the battle of Toulouse (April 10, 1814) the French under Soult were defeated by Wellington. Cujacius was born, and Fermat died, in Toulouse.

**Toungu,** the chief town of the district of the same name in British Burma; on the right bank of the Sittang river, down which it exports timber and rice. It was the capital of the Pegu dynasty, which attained great power in the 16th century, and was chosen in 1858 for the exile of Behaudur Shah, the banished Mogul Emperor of Delhi, and afterward was the residence of his son. The district of Toungu lies on the frontier N. of Rangoon and E. of Prome; area 6,354 square miles. It is the home of the aboriginal tribe of Karens.

**Touraco,** in ornithology, the genus *Corythaix;* beautiful African birds, with a short, rather small, high bill; both mandibles notched and finely serrated; short, rounded wings, with the three first quills graduated; a long rounded tail, and short, strong feet. They have an erectile crest on the head. Their prevailing color is green, with purple on the wings and the tail. They feed on fruits, and perch on the highest branches of trees.



TOURACO.

**Touraine,** an ancient province of France; bounded N. by Maine, E. by Orléanais and Berry, S. by Berry and Poitou, and W. by Anjou and Poitou. It now forms the department of Indre-et-Loire.

**Tourcoing,** a town of France, department of Nord; 9 miles N. N. E. of Lille; is a well-built thriving manufacturing town, the staple manufactures being woolen, cotton, linen, and silk stuffs, besides dye works, soap works, sugar refineries, machine works, etc. Pop. (1906) 81,671.

**Tourgee, Albion Winegar,** an American jurist and author; born in Williamsfield, O., May 2, 1838; was graduated at Rochester University, N. Y., in 1862; admitted to the bar, 1864; served in the Civil War in the Union army, and was wounded on two occasions; at the close of the war commenced the practice of law at Greensboro, N. C., and at the Southern loyalist convention at Philadelphia, 1866, drew up the report on the condition of the States lately in revolt. In 1868 he became judge of the Superior Court of North Carolina. Besides compiling "A Code of Civil Procedure for North Carolina" he wrote "A Fool's Errand"; "An Appeal to Cæsar"; "Bricks Without Straw"; "The Story of a Thousand"; "The Man Who Outlived Himself"; "Letters to a King"; etc. In 1897 he was appointed United States consul at Bordeaux, France. He died May 21, 1905.

**Tourgee, Eben,** an American musician; born in Warwick, R. I., June 1, 1834; opened a small music store in Fall River, Mass., in 1851, and two years later began teaching music in the public schools. He established a musical institute in East Greenwich in 1859; studied in Europe in 1863; and on his return in 1864 founded a conservatory in Providence, R. I., which, on its removal to Boston, Mass., in 1867, became the New England Conservatory of Music. In 1872, on the foundation of the College of Music of Boston University, he became its dean. He was also director of the 20,000 singers forming the chorus of the Peace Jubilee in 1874, and the organizer and leader of the large choir of the Music Hall Society in 1876. He died in Boston, Mass., April 12, 1891.

**Tourguenieff.** See TURGENEFF.

**Tourmaline,** a widely-distributed mineral, the transparent colored varieties being used as gem-stones. Its crystallization, is rhombohedral, hemimorphic; prisms often triangular. Hardness, 7–7.5; sp. gr. 2.94–3.3; luster, vitreous; color, shades of black the most frequent, but also blue, green, red, often of rich shades, sometimes red internally and shades of green externally, crystals sometimes varying in color toward the extremities, occasionally but rarely colorless; markedly dichroic; transparent to opaque; fracture, uneven, sometimes subconchoidal; pyroelectric. Composition: Very variable, the oxygen ratio for the protoxide and sesquioxide, and also for the boric acid, varying considerably. Dana distinguishes the following varieties: (1) Rubellite; shades of red, frequently transparent. (2) Indicolite; of an indigo-blue color. (3) Brazilian sapphire of jewelers; Berlin blue. (4) Brazilian emerald, Chrysolite (or Peridot); green and transparent. (5) Peridot of Ceylon; honey-yellow. (6) Achroite; colorless. (7) Aphrizite; black. (8) Columnar and black, without cleavage or trace of fibrous texture. A series of analyses and sp. gr. determinations, made by Rammelsberg, has suggested the following subdivisions: (1) Magnesia tourmaline,

mean sp. gr. 3–3.07; (2) Iron-magnesia tourmaline, mean sp. gr. 3.11; (3) Iron-tourmaline, sp. gr. 3.13–3.25; (4) Iron-manganese-lithia tourmaline, mean sp. gr. 3.083; (5) Lithia tourmaline, mean sp. gr. 3.041. The blowpipe reactions vary with the composition, which is essentially a boro-silicate of protoxide and sesqui-oxide. Occurs in granites, notably the albitic varieties, schists, and dolomite.

**Tourmaline Plates,** in crystallography, sections of crystals of tourmaline cut parallel to the axis. Such sections have the property of polarizing light, and though now largely superseded by Nicol's prisms, are still convenient for some purposes, in spite of their color, owing to their large angular field of vision.

**Tourmanin,** an ancient and now ruined town of Central Syria, notable for a curious assemblage of buildings comprising a church, and an immense structure which seems to have been an ecclesiastical hostelry for lodging pilgrims. The church, restored from a careful study of the surviving portions, follows the general plan and arrangement of most Syrian churches of the 5th century. The façade has an imposing character, while the disposition of the lines gives to it a picturesque effect.

**Tournament,** an encounter between armed knights on horseback in time of peace, as an exercise of skill (which was rewarded by honorary distinctions), and usually an adjunct of some great event, as a royal marriage, etc. The tournament was one of the most cherished institutions of the Middle Ages, furnishing, as it did, an exciting show, and giving the combatants an opportunity of exhibiting their skill, courage and prowess before their friends. The regulations which governed these displays were propounded by the sovereign and enforced by kings-at-arms and heralds. They were usually held by the invitation of some prince, which was proclaimed throughout his own dominions, and frequently also at foreign courts, so that parties from different countries might join. They differed from jousts, in that the latter were merely trials of military skill between one knight and another. The arms employed were usually lances without heads, and with round braces of wood at the extremity, and swords without points and with blunted edges. Occasionally, however, the ordinary arms of warfare were used, and it not infrequently happened that the tournament ended in a hostile encounter. Certain qualifications of birth were required for admission to the tournaments. The place of combat was the lists, a large open space surrounded by a rope or railing, and having galleries erected around for the spectators, the heralds, and the judges. The tilting armor was of light fabric, and generally adorned with some device of a lady's favor. The prizes were delivered to the successful knights by the queen of beauty, who had been chosen by the ladies or appointed by the king. On the second day there was often a tournament for the esquires, and on the third a mêlée of knights and esquires in the lists.

In modern usage, a competition or contest of skill, in which a number of individuals take part; as, military tournament; cycling tournament; billiard tournament, etc.

**Tournay,** a town in the Belgian province of Hainault; on the Scheldt; near the French frontier; 35 miles W. S. W. of Brussels. Its splendid Romanesque cathedral, 400 feet long, has five towers and pictures by Jordaens, Rubens, and Gallait; and there are also the churches of St. Quentin and St. Brice (with the grave of King Childeric), the belfry (1190), and a bronze statue (1863) of the Princess d'Epinoy, who in 1581 valiantly defended Tournay against Parma. Though one of the oldest towns in Belgium, it has quite a modern appearance, with fine suburbs and beautiful broad streets. The chief manufactures are hosiery, linen, Brussels carpets, and porcelain; but there are few large workshops, most of the fabrics being executed by the people in their own houses. Tournay, the ancient Tornacum, or Turris Nerviorum, was in the 5th and the beginning of the 6th century the seat of the Merovingian kings, subsequently belonged to France, but in 1526 was included in the Spanish Netherlands. During May, 1794, it was the scene of several hotly contested fights between the French and Austro-English armies, the most important of which was that of May 19, in which Pichegru beat the Duke of York. Pop. (1909) 37,640.

**Tournefort, Joseph Pitton de,** a French botanist; born in Aix, Provence, in 1656. He was educated by the Jesuits, and in 1683 became Professor of Botany at the Jardin des Plantes, Paris. He visited Greece and Asia Minor, and wrote "A Journey to the Levant." His chief work is entitled "Families of Plants" (3 vols. Paris, 1700). He was the first botanist to group plants in genera. He died in Paris, in 1708 being then Professor of Medicine in the Collége de France.

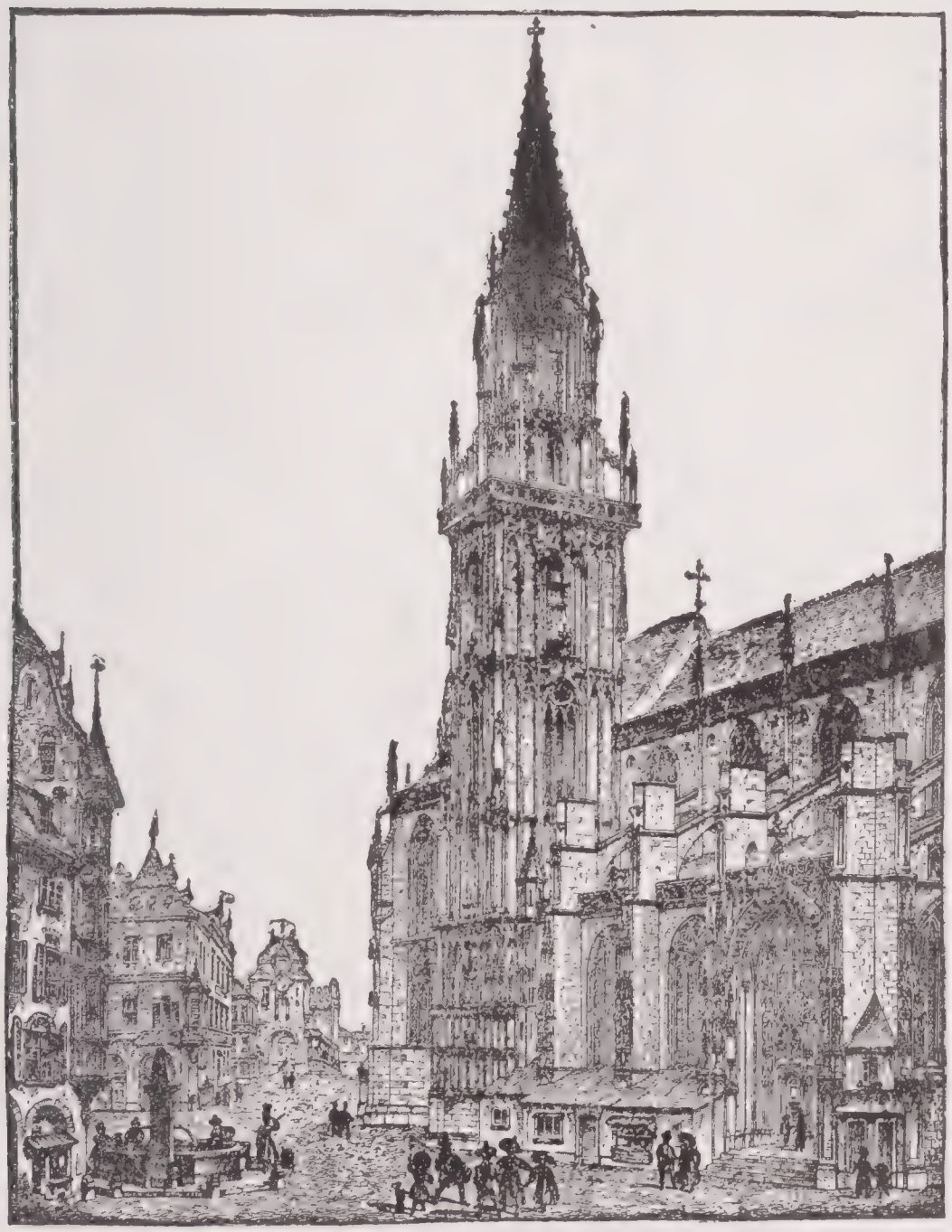
**Tournefortia** (named after Joseph Pitton de Tournefort, 1656–1708, a French traveler and systematic botanist), the typical genus of *Tournefortеæ;* Corolla salver-shaped or rotate, with its throat naked; stamens included within the tube of the corolla; stigma peltate; fruit a drupe, inclosing two nuts, each two-seeded. Known species about 50, from the warmer countries. *T. umbellata* is used in Mexico to

cleanse ulcers, to allay inflammation, and as a febrifuge.

**Tourniquet,** an instrument for compressing the main artery of the thigh or arm, either for the purpose of preventing too great a loss of blood in amputation, or to check dangerous hemorrhage from accidental wounds, or to stop the circulation through an aneurism. For the last purpose special forms of tourniquet are required, which do not compress the whole limb.

The common tourniquet consists of three parts — viz. (1) a pad to compress the artery; (2) a strong band which is buckled round the limb; and (3) a bridge-like contrivance over which the band passes, with a screw whose action raises the bridge and consequently tightens the band. The best kind of pad is a small firm roller bandage, about an inch thick; it must be placed lengthways over the main artery so as to compress it against the bone, and must be secured in its place by a turn of bandage, over which the band of the tourniquet must be applied. This band must first be tightly buckled, and the pressure must be then quickly increased to the necessary extent (viz., till the circulation through the limb is completely arrested) by the action of the screw, which should always be opposite the buckle of the band.

The credit of the invention of this most useful instrument is usually ascribed to the French surgeon Morel, who, in 1674, used a stick passed beneath a bandage, and turned round so as to twist it up to the requisite degree of tightness, as a means of preventing the undue loss of arterial blood in amputations of the limbs — a rough but by no means ineffectual form of tourniquet, which may often be usefully extemporized in cases of emergency at the present time. Mr. Young of Plymouth, in 1679, described a similar apparatus. A much improved screw tourniquet was invented by Petit in 1718, the same in principle as that described above. Many surgeons now use in preference a strong elastic band, wound two or three times round the limb — a method first introduced by Esmarch.



TOURS: CHURCH OF ST. MARTIN.

**Tours,** a town of France, capital of the department of Indre-et-Loire; on the Loire; 145 miles S. W. of Paris. The Loire is here crossed by two suspension bridges, a railway bridge, and a fine stone bridge 1,423 feet long. Many of the streets are spacious, and there are several historic chateaus in the neighborhood. The principal edifice is the cathedral (Tours being an archbishopric), flanked by two towers, 205 feet high, a fine building begun in the 12th, completed in the 16th century. Of the old abbey church of St. Martin of Tours only two towers remain. The modern buildings include the church of St. Joseph, the theater, and the museum. Manufactures include silk, cloth, carpets, chemicals, etc., and there is a large printing and publishing establishment. Tours was known to the Romans by the name of Cæsarodunum. In later times it became famous for its silk manufactures, and had a population of 80,000, when the revocation of the edict of Nantes deprived it of nearly half its inhabitants, a blow from which it has never recovered. In 1870 Tours was the seat of

the government of national defense. Pop. (1906) 67,601.

COMMON TOURNIQUET.

**Tours, Berthold,** a French composer; born in Rotterdam, Holland, Dec. 17, 1838. He went to London in 1861, and became musical editor to Novello, Ewer & Co. after 1878. His writing was chiefly for the Church, and his "Service in F," "Blessing, Glory, Wisdom, and Thanks," and "O Saving Victim" were especial favorites. As a church composer he represented, with Stainer and Barnby, a new phase of English Church music which comprehends the introduction of new dramatic and melodic material, for which the entire school is indebted to M. Gounod. He died March 3, 1897.

**Tourville, Anne Hilarion de Cotentin, Comte de,** a French naval officer; born in Tourville, La Manche, Nov. 24, 1642; joined the Maltese Order in 1656, and in 1660 entered the French navy, of which he became a captain in 1667, and commanded a ship of the line in the Mediterranean during the war with the Dutch and Spaniards (1672–1674). In 1675 he served first under the Chevalier de Balbette; then under Duquesne; and on the return from Agosta, where he fought with distinction, he destroyed 12 ships of the Dutch-Spanish fleet at Palermo (1677). He was appointed Lieutenant-General of the navy (1680), and bombarded Algiers three times (1682, 1683, and 1688). Vice-admiral of the Levant in 1689, he commanded in 1690 the fleet that supported James II. in Ireland; and in command of the French channel fleet defeated the Dutch and English fleets (112 sail) at the Isle of Wight in July, 1690. In order to facilitate the landing of the Jacobites on the English coast, he was ordered to attack with 44 ships the British and Dutch fleets under Admiral Russell at Cape de la Hogue, and was defeated. In 1693 he was made Marshal of France, and in 1694, meeting an English and Dutch trading fleet, he took 27 vessels and destroyed 4 in the pursuit. He died in Paris, May 28, 1701.

**Tous les Mois** (tô lā mwâ), the *Canna edulis*, a perennial herb, about three feet high, a native of Peru, having large tuberous roots, stems colored at the base; the corolla, which is red, with a very short middle segment. It is now cultivated in hot houses.

**Tous les Mois Starch,** a starch extracted from the tubers of *Canna edulis*, imported chiefly from St. Kitts, and sometimes called French arrowroot. The granules are large and exhibit a glistening appearance, flat, broad, and ovate in form, and slightly pointed at the narrow end. The hilum, which is small and circular, is situated near the narrow end of the granule, and is surrounded by a series of fine, regular, and distinctly marked rings. The jelly yielded by this starch is said to be more tenacious but less clear than that of arrowroot.

**Toussaint l'Ouverture, Dominique François** (surname added for his bravery in once making a breach in the ranks of the enemy), one of the liberators of Haiti; born a slave in 1743; joined the negro insurgents in 1791; and in 1795, for his services against the Spainiards, was made by the French Convention general of brigade, in 1797 general of division, and a little later chief of the army of Santo Domingo. Soon after he cleared the British and Spaniards entirely out of the island, quickly restored order and prosperity, and about 1800 began to aim at independence of France. Bonaparte having, after the peace of Amiens, proclaimed the reëstablishment of slavery in Santo Domingo, Toussaint declined to obey, whereupon General Le Clerc was sent with a strong fleet to compel him. The liberator soon submitted, but was treacherously arrested, sent to France, and flung into a damp, dark dungeon at Fort de Joux, near Besançon, where he died after 10 months, April 27, 1803.

**Tout Ensemble** (tôt âng-sāmbl'), the whole of anything taken together; anything regarded as a whole without regard to distinction of parts; specifically in the fine arts, the general effect of a work of art without regard to the exectuion of details.

**Tovomita,** in botany, a genus of *Clusiœ*. Flowers cymose; sepals two or four, the outer ones the larger; petals four or eight; stamens indefinite; fruit four-celled, four-valved, four-seeded. Known species 21 or more. The bark of *T. fructipendula*, a tree growing in the Andes of Peru,

is used for dyeing a reddish-purple, and also as a medicine.

**Tower, Charlemagne,** an American diplomatist; born in Philadelphia, Pa., April 17, 1848; was graduated at Harvard University in 1872, and admitted to the bar in 1878. He acquired large business interests and became an officer and director in several corporations; and was identified with the Academy of Natural Sciences and other similar organizations. In 1897 he became United States minister to Austria-Hungary; in 1899 ambassador to Russia; and in 1902 ambassador to Germany. He is the author of "The Marquis de La Fayette in the American Revolution" (2 vols. 1895).

**Tower, Zealous Bates,** an American military officer; born in Cohasset, Mass., Jan. 12, 1819; was graduated at the United States Military Academy in 1841; was promoted 2d lieutenant of engineers in the same year, and 1st lieutenant in 1847; was employed in the construction of the defenses about Hampton Roads in 1843–1846; served in the Mexican War and won distinction at Cerro Gordo, Contreras, and Chapultepec. In 1848–1861 he was engaged in the building of defenses on the Pacific coast; was promoted major in August, 1861; fought in the first battle of Bull Run and took part in the Virginia campaigns of Generals Banks and Pope; was severely wounded at the second battle of Bull Run; and for bravery in that action was brevetted Major-General; was promoted lieutenant-colonel in November, 1865, and colonel in January, 1874; and was retired in 1883. He died in Cohasset, Mass., March 21, 1900.

**Tower Hill,** a hill in London, near the famous Tower of London, and the place where many political prisoners were executed.

**Tower of London,** the most ancient, and historically the most interesting pile in the English metropolis; a mass of buildings on the N. side of the Thames, immediately to the E. of the ancient city walls, its ramparts and gates surrounded by a dry ditch in pentagonal shape; in outer circuit measuring 1,050 yards. Within this the whole of the buildings are encircled by a double line of walls and bulwarks, in some places 40 feet high and 12 feet thick; the space between the walls being known as the outer ward, and the interior as the inner ward. The inner ward was formerly the royal quarter. The outer ward was the folk's quarter. The inner ward is defended by 12 massive and conspicuous towers, stationed at unequal distances, and possessing distinctive names and formations. In the center, rearing its head proudly above them all, stands the main quadrangular building and great Norman keep known as the White Tower. To the N. are the barracks, and to the N. W. the Church of St. Peter ad Vincula. The entrance to the buildings is on the W. side by the Lion's Gate.

Tradition ascribes the origin of the Tower to Julius Cæsar. The White Tower was reared by William the Conqueror, probably as a secure place of shelter for himself and a menace to the turbulent citizens. It was designed by Gundulph, Bishop of Rochester, and bears a sister likeness to Rochester Castle. It is in three stories, is 116 feet long, 96 feet wide, and 92 feet high. Gundulph also designed the original Church of St. Peter's, a finer building than that reared in its place when it crumbled into ruin in the reign of Edward I. Henry III., who left so many epics in stone to attest his architectural genius, spent much of his life and treasure in adding to the splendor of the Tower. He enriched it with frescoes and sculptures, with marble shafts and delicate traceries. Traitor's Gate was built by him, the noble arch under which so many noble heads passed to their doom. Wren refaced the White Tower and modernized its windows, but its interior still bears the splendid stamp of its grand antiquity.

For centuries the Tower was a palace, a prison, a fortress, and a court of law. Here the Plantagent kings held their gay tournaments, magnificent revels, and pompous religious ceremonials. Here also tragedy succeeded tragedy, and the innocent blood of many of England's bravest and most beautiful poured forth in a cruel stream. Wise statesmen, fair queens, child princes, noble warriors and priests were slain, their only crimes in many cases being their rank, their patriotism, and their faith. "No sadder spot on earth," says Macaulay, "in England . . . Death is there associated . . . with whatever is darkest in human nature and in human destiny, with the savage triumph of implacable enemies, with the inconstancy, the ingratitude, the cowardice of friends, with all the miseries of fallen greatness and of blighted fame."

The first State prisoner was Flambard, Bishop of Durham, who effected his escape in 1100 and fled to Normandy. The noble Wallace suffered a cruel imprisonment and terrible death here in 1305. The good Lord Cobham's story and fate are associated with the Beauchamp Tower. Charles, Duke of Orleans, imprisoned in the Banqueting Hall for a quarter of a century by Henry V., commemorated there his dead wife in touching verse. A volume of his poems in the British Museum contains the earliest known representation of the Tower. Richard, Duke of Gloucester, haunts the pile like a specter. He murdered Henry VI. in the Hall Tower. The infant princes, his nephews, were smothered in the Bloody Tower; their supposed remains, found in the reign of Charles II., now lie in Westminster Abbey. Clarence, according to tradition, was

drowned by Richard in wine in the Bowyer Tower, and Hastings condemned to death in the Council Chamber. The remains of King Henry VIII.'s beheaded queens, Anne Boleyn and Katherine Howard, lie in St. Peter's Church. A group of ghastly executions are associated with the reign of Mary, prominent among which are those of Lady Jane Grey, the wise, fair, and pious "Twelfth Day queen," her consort Dudley, and her father-in-law, Northumberland. Imprisoned together in the Garden Tower, Cranmer, Ridley, and Latimer searched the New Testament together. Sir Walter Raleigh was thrice confined in the Tower which bears his name in many places. Here he wrote his "History of the World," and beguiled his solitude with chemical experiments. Sir T. Overbury was poisoned in the Tower in 1613, and Strafford was beheaded in 1641, Laud in 1645. The last of the numerous executions in the Tower, but a few of which have been mentioned, was that of Lord Lovat in 1747. Among notable persons imprisoned here were Algernon Sydney, Lord William Russell, the Seven Bishops, the Duke of Marlborough, Sir Robert Walpole, John Wilkes, Lord George Gordon, and Sir F. Burdett. Arthur Thistlewood, in 1820, was the last State prisoner.

The public are admitted to the Tower on Mondays and Saturdays gratis, and on other days on payment of 6d. to see the Armory and White Tower, and 6d. to see the crown jewels. The government of the Tower is vested in the Constable, usually an officer of high military rank. Strangers are shown over the buildings by the warders or beefeaters. The Records and the Mint, now removed, were for a long time established in the Tower, which is now a great ordnance store and depository of valuables. In the White Tower is the Chapel of St. John, which formerly held the records, one of the finest specimens of Early Norman style. The banqueting Hall and Council Chamber adjoining is used as an armory, and is filled with 60,000 stand of arms, kept in perfect order and beautifully arranged. On the S. side of the White Tower there are some interesting specimens of early gunnery. The Beauchamp Tower, which was restored in 1853 by Mr. Salvin, is to the W., and the Horse Armory to the S. The latter, built in 1826, contains a gallery 150 feet long by 33 feet wide, in which are 22 equestrian figures clothed in the distinctive armor of the reigns from Edward I. to James II. A staircase from the Horse Armory leads to an ante-chamber filled with weapons and trophies taken in British struggles in the East. Queen Elizabeth's Armory in the White Tower contains arms and armor of her reign, various instruments of torture, the beheading axe said to have been used in the execution of the Earl of Essex, and the block on which Lord Lovat was beheaded. The Jewel House contains several crowns, including that for the coronation of Queen Victoria (valued at £111,900), the Kohinoor diamond, and the diadems, scepters, and jewels constituting the Regalia. The Wellington Barracks, a large castellated building on the N. side of the West Tower, were erected in 1845, on the site of the Grand Storehouse built by William III., which was, along with 280,000 stand of muskets contained in it, destroyed by fire in 1841. To the N. W. of the Tower is Tower Hill, the dire spot where, till within about 150 years, stood the scaffold for the execution of traitors.

**Tower of Winds,** a building on the acropolis of Athens; built by Andronicus Kyrrhestes. It is a small, octagonal structure, and one of the best preserved buildings of ancient Athens.

TOWER OF WINDS IN ATHENS.

**Towle, George Makepeace,** an American author; born in Washington, D. C., Aug. 27, 1841; was graduated at Yale University in 1861, and at Harvard Law School in 1863. He was United States consul at Nantes, France, in 1866–1868; and at Bradford, England, in 1868–1870. His works include: "Glimpses of History" (1865); "Henry the Fifth" (1866); "American Society" (1870); "The Eastern Question" (1877); "Servia and Rumania" (1877); "Beaconsfield" (1878); "Young Folks' Heroes of History" (1878–1880); "Modern France" (1879); "Men of Mark" (1880); "England and Russia in Asia" (1885); "England in Egypt" (1885); "Literature of the English Language." He died in Brookline, Mass., Aug. 10, 1893.

**Towler, John,** an American educator; born in Rathmell, England, June 20, 1811; was educated at Cambridge University, England; removed to the United States and was made Professor of Modern Languages at Hobart College, Geneva, N. Y., in 1850. Five years later he was graduated at the Medical Department of that institution; was there Professor of Chemistry, Toxicology, and Medical Jurisprudence in 1853–1873. He was United States consul to Trinidad, W. I., in 1882–1886. In the latter year he settled in Orange, N. J., and devoted his time to literary work. His publications include "The Silver Sunbeam" (1863); "Dry Plate Photography" (1865); "The Porcelain Picture" (1865); "The Magic Photography" (1866); "The Negative and the Print" (1866); "The Tannin Process" (1867); etc.

**Towles, Catharine Webb,** an American author; born in Charlemont, Mass.,

Oct. 25, 1823. She was editor of several Southern magazines, and published: "Three Golden Links" (1857); "Tales for the Freemason's Fireside" (1859); "Poor Claire; or, Life Among the Queer" (1883).

**Townley Marbles,** a collection of Greek and Roman sculpture, forming a portion of the gallery of antiquities in the British Museum, and so named after Charles Townley, of Townley, Lancashire, England, by whom the collection was made.

**Townsend, Charles Henry Tyler,** an American entomologist; born in Oberlin, O., Dec. 5, 1863; received a high school education and then studied medicine at Columbian University. He was assistant entomologist in the United States Department of Agriculture in 1888–1891 and then became Professor of Entomology, Physiology, and Zoölogy at the New Mexico Agricultural College. In 1894–1898 he was temporary field agent in the division of entomology of the United States Department of Agriculture in Texas, Mexico, and New Mexico. In 1900 he was made acting custodian and special collector of customs and disbursing agent in El Paso, Tex. He was the author of some 300 titles on biogeography and economic and systematic entomology.

**Townsend, Edward Davis,** an American military officer; born in Boston, Mass., Aug. 22, 1817; was graduated at the United States Military Academy in 1837, and commissioned a lieutenant in the 2d artillery. He served in Florida in 1837–1838 and on the Canadian frontier in 1838–1841; was promoted captain in 1848 and colonel in 1861. In the latter year he was made chief of staff to Lieut.-Gen. Winfield Scott. In March, 1865, he was brevetted Major-General U. S. A. for "faithful, meritorious, and distinguished services in the adjutant-general's department during the rebellion." He was placed on the retired list in 1880. During all of the Civil War he was the chief executive officer of the army which brought him probably more than any other military officer into close personal contact with President Lincoln and Secretary Stanton. His publications include "Catechism of the Bible — The Pentateuch" (1859); "Catechism of the Bible — Judges and Kings" (1862); and "Anecdotes of the Civil War in the United States" (1884). He died in Washington, D. C., May 11, 1893.

**Townsend, Edward Waterman,** an American author; born in Cleveland, O., Feb. 10, 1855. His stories and sketches, first printed in the daily journals, were collected under the titles: "Chimmie Fadden, Major Max, and Other Stories"; "Chimmie Fadden Explains, Major Max Expounds"; "A Daughter of the Tenements"; "Near a Whole City Full." In collaboration he wrote several plays: "Chimmie Fadden"; "Daughter of the Tenements"; "The Marquis of Michigan," etc.

**Townsend, George Alfred,** pseudonym, Gath, an American war correspondent; born in Georgetown, Del., Jan. 30, 1841. He became a journalist in 1860; was special correspondent for the New York "Herald" and New York "World" in 1860–1864; afterward public lecturer, and war correspondent in the Austro-Prussian War (1866). His publications in book form are: "Campaigns of a Non-Combatant" (1865); "Life of Garibaldi" (1867); "Life of Abraham Lincoln" (1867); "The New World and the Old"; "Poems" (1870); "Washington Outside and Inside" (1871); "Bohemian Days" (1881); "The Entailed Hat" (1884), and "Katy of Catoctin; or, The Chain-Breakers" (1886), novels; "Life of Levi P. Morton" (1888); "Tales of Gapland"; etc.

**Townsend, George Washington,** an American author; born in West Chester, Pa., Feb. 1, 1839; engaged in business in 1856–1869; was admitted to the bar in Philadelphia in 1874. In his book entitled "Wherewith Method" he claims to have discovered the best method of "how to educate," and in an address before a Congressional committee made an argument in its favor. His publications include: "Fifteen Minutes' Sunday Work"; "Wherewithal, or New Discoveries in Cause and Effect"; "Jacob's Ladder"; "Also Napoleon Slips"; and "Adult Kindergarten." He died in 1905.

**Townsend, Luther Tracy,** an American clergyman; born in Orono, Me., Sept. 27, 1838; was graduated at Dartmouth College in 1859 and at Andover Theological Seminary in 1862. He then enlisted in the 16th New Hampshire regiment and served first as a private and afterward as adjutant; was ordained in the Methodist Church in 1864. He was Professor of Hebrew, and Chaldee and New Testament Greek at the Boston University in 1868–1870; Professor of Sacred Rhetoric and Practical Theology in the same institution in 1872–1893; and then became professor emeritus. His publications include "Credo" (1869); "Sword and Garment" (1871); "God Man" (1872); "Lost Forever" (1873); "Arena and Throne" (1874); "Intermediate World" (1878); "Fate of Republics" (1880); "Art of Speech" (2 vols. 1880–1881); "The Bible and Other Ancient Literature" (1885); "History of the Sixteenth Regiment, New Hampshire Volunteers" (1896); "Story of Jonah in the Light of Higher Criticism" (1898); "Anastasis" (1900); etc.

**Townsend, Mary Ashley,** pseudonym, Xariffa; an American author; born in Lyons, N. Y., about 1836. She contributed sketches to the New Orleans "Delta" that

attracted attention, and afterward published, "Xariff's Poems"; "The Brother Clerks" (1859); "Poems" (1870); "The Captain's Story" (1874); "Down the Bayou"; etc. (1884). She died in 1901.

**Townsend, Virginia Frances,** an American author; born in New Haven, Conn., in 1836. She edited "Arthur's Home Magazine," contributed to many journals and magazines, and wrote many popular novels, among them, "While It Was Morning" (1859); "Amy Deane, and Other Tales" (1862); "The Well in the Rock," etc. (1863); "The Battle Fields of our Fathers" (1864); "Janet Strong" (1865); "Darryl Gap" (1866); "The Hollands" (1869); "One Woman's Two Lovers" (1872); "Elizabeth Tudor" (1874); "Only Girls" (1876); "Six in All" (1878); and "Our Presidents" (1888); "But a Philistine"; "That Queer Girl"; etc.

**Townshend, Charles, 2d Viscount,** an English statesman; born in Rainham, Norfolk, March 10, 1674; succeeded to the peerage December, 1687, and took his seat as a Whig in the House of Peers, 1695. After acting as a commissioner for arranging the Scotch Union (1706), he was joint plenipotentiary with Marlborough in the conference at Gertruydenburg (1709), and then, as ambassador to the States-General, signed the Barrier Treaty. For this he was censured by the House of Commons, and declared an enemy to the queen and kingdom. He thereupon entered into communication with the Elector of Hanover; who, on his accession as George I., appointed Townshend secretary of state, 1714. In 1717 he became lord-lieutenant of Ireland; and he was again secretary of state from February, 1721, to May, 1730, when he retired on account of differences with his brother-in-law and colleague, Sir Robert Walpole. He died in Rainham, June 21, 1738.

**Townshend, Charles,** an English statesman; grandson of the 2d Viscount; born in 1725; entered the House of Commons in 1747; and became a commissioner of trade and plantations in 1749. He was a lord of the admiralty in 1754, member of the privy-council in 1756, secretary of war in 1761–1763; chancellor of the exchequer in 1766. He supported Granville's stamp act (1765), and introduced the celebrated resolutions for taxing the American colonies (June 2, 1767). From so often changing his political opinions he was known as the "weathercock," but he had a great reputation for oratory and wit. He died in Oxfordshire, Sept. 4, 1767.

**Township,** the corporation of a town; the district or territory of a town. Also, a territorial district, subordinate to a county, into which many of the States are divided, and comprising an area of 5, 6, 7, or perhaps 10 miles square, the inhabitants of which are invested with certain powers for regulating their own affairs, such as repairing roads, providing for the poor, etc.

**Toxicology,** that branch of medicine which treats of poisons and their antidotes, or of the morbid and deleterious effects of excessive and inordinate doses and quantities of medicine.

**Toxocampidæ,** in entomology, a family of *Noctuina*. Moths of moderate size, the thorax smooth with a raised collar; abdomen smooth, somewhat flattened; the wings not dentate. Larva smooth, elongate, attenuated at each end, with 16 legs.

**Toxoceras,** in palæontology, a genus of *Ammonitidæ*, having the shell simply arcuate or bent like a horn. Twenty species, ranging from the Lower Oölites to the Gault, but the genus is characteristically Cretaceous.

**Toxocerus,** in entomology, a genus of *Collembola*, with three species, two of which (*T. plumbeus* and *T. niger*) are European.

**Toxodon,** in palæontology, a genus of Owen's *Toxodontia*. They were about the size of a hippopotamus; the teeth consist of large incisors, very small lower canines, and strongly-curved molars, all with persistent roots. According to Cope, the tarsal bones more nearly resemble those of the *Proboscidea* than any other known *Ungulates*. The genus was discovered by Darwin, and many specimens have since been found in Pleistocene deposits near Buenos Ayres, and have been described by Owen, Gervais, and Burmeister.

**Toxodontia,** an order of Mammalia founded by Owen for the reception of the genera *Toxodon* and *Nesodon*.

**Toxotes,** in ichthyology, a genus of *Squamipinnes*, with two species, from the East Indies. Body short, compressed, covered with scales of a moderate size; snout pointed, with wide lateral mouth and projecting under jaw; one dorsal, with five strong spines on posterior part of the back; anal with three spines. *T. jaculator*, the more common species, ranges to the coast of Australia. It owes its specific name to its habit of throwing a drop of water at insects which it sees near the surface in order to make them fall in, and so bring them within its reach. The Malays keep it in a bowl in order to witness this habit, which persists in captivity.

**Toy.** Till within recent years all the toys which American children used were brought from Europe, chiefly from Germany, Switzerland, and France. Germany furnished the wooden playthings, and whole families were employed in cutting, carving, and painting the miniature houses, furni-

ture, jumping-jacks, Noah's arks, soldiers, etc. From Switzerland came the beautifully carved articles and the curious mechanical toys, while France supplied the dolls of the finer kinds, those of wood being made in the Tyrol and in Saxony. Papier maché doll heads and animals, as well as most kinds of marbles, came from Germany and Bavaria. Toy musical instruments, and tin, iron, and pewter playthings used to be made entirely in Germany and England. The cheapness of labor, especially in the mountainous countries of Bavaria, Saxony, and the Tyrol, enabled the merchant to sell these handmade products at very low prices. Toy factories have sprung up in the United States, however, and almost every kind of toy that can be made by machinery can be found in the United States. In one factory in Massachusetts the specialty is toy drums, tin soldiers and warships; in another, wooden toys, such as doll houses and furniture, washtubs, building blocks and hobby horses. are turned out in immense quantities; still another in New York makes tin toys of all kinds. The first American doll factory was established in Brooklyn about 1892, and furnishes that great desideratum, an "unbreakable" doll. See DOLL.

**Toy, Crawford Howell,** an American scholar; born in Norfolk, Va., March 23, 1836; was graduated at the University of Virginia in 1856; studied at the University of Berlin in 1866–1868; and became Professor of Hebrew at Harvard University in 1880. He wrote: "History of the Religion of Israel" (1882)); "Quotations in the New Testament" (1884); "Judaism and Christianity: Progress of Thought from the Old Testament to the New" (1890), etc.

**Toynbee, Arnold,** an English reformer; born in London, England, Aug. 23, 1852. His early acquirements were mostly in the direction of modern literature and philosophy. He spent two years at a military college, but left on finding that he had mistaken his profession. During the four years he spent at Oxford he became a prominent figure among an attached circle of students, studied political economy, and read in a miscellaneous fashion. Endowed with the gift of fluent speech, he began to address audiences of working men; and believing that the poor could only be adequately helped by those who had lived among them and felt their needs, he took up residence in Commercial Road, Whitechapel, in 1875, and associated himself with the religious work carried on there by the Rev. S. A. Barnett. From the inspiration of his example and teaching during this period sprang the idea of Toynbee Hall. He died in 1883, owing to overstrain following on two lectures directed against Henry George's "Progress and Poverty." A course of lectures delivered at Oxford between 1881–1882 on the economic history of England, along with other popular addresses, was published in 1884 under the title of "The Industrial Revolution," with Memoir by Jowett.

**Toynbee Hall,** a settlement organized in Commercial Street, Whitechapel, London, as a memorial to ARNOLD TOYNBEE (*q. v.*), in January, 1885, under the direction of the Rev. S. A. Barnett. It partakes somewhat of the nature of both a college and a club, the idea being to connect the memorial of Toynbee with the study of "political economy in its social aspects, to which he devoted the scholar half of himself, and with his work among the artisan population of our great cities, to which he gave the other, the missionary half." This is carried out by the members of the universities of Oxford and Cambridge who find residence there, who strive "to provide education and the means of recreation and enjoyment for the people, to inquire into the condition of the poor, and to consider and advance plans calculated to promote their welfare." During the first four years there were 54 residents. The idea of college settlements suggested by this work, was enthusiastically carried out in the United States; a large number of "settlements" being established in connection with institutional churches, and various forms of missionary work.

**Trabue, Isaac Hodgen,** an American lawyer; born in Russell co., Ky., March 25, 1829; received an academic education and was graduated at the Law School of Transylvania University, Lexington, Ky., in 1854. He recruited a company of soldiers for the Union army in June, 1861, and served in the war first as captain and later as colonel. He owned a large number of slaves, the male members of whom he put to work in the commissary department while the women were sent to hospitals as nurses. He became a well known chess player, and in 1883 beat Zuckertort, the champion of the world. Later he established the rules governing four handed chess. He became an orange grower in Florida, and in 1900 strongly opposed the projected removal of the State capitol from Tallahassee. His publications include "Hobson Blowing up the Merrimac in Santiago Bay" (a drama); and "Black Wench" (an historic novel). He established the town of Trabue, Fla., which was later named Punta Gorda. Died in 1907.

**Tracery,** in architecture, the species of pattern work formed or traced in the head of a Gothic window by the mullions being continued, but diverging into arches, curves, and flowing lines enriched with foliations. The styles varied in different ages and countries, and are known as geometrical, flowing, flamboyant, etc. Also the subdivisions

of groined vaults, or any ornamental design of the same character for doors, paneling, ceilings, etc.

**Trachea,** or **Windpipe,** the tube extending from the larynx, or organ of the voice, and from the level of the fifth cervical vertebra to the third dorsal vertebra, at which latter point the trachea bifurcates or divides into two main bronchi or divisions, one supplying each lung with air tubes. The average length of the trachea is 4½ inches, and its diameter about three-fourths of an inch, the latter measurement being greater in males than in females. The trachea consists of fibrous membranes united by elastic cartilaginous rings, rendering the tube flexible and patent. The cartilages are circular but imperfect rings, each being joined posteriorly by fibrous membrane. They vary from 16 to 20 in number. The muscular fibers of the trachea are of longitudinal and transverse arrangement. The trachea is lined with mucous membrane, the epithelium of which is ciliated. The trachea receives blood from the inferior thyroid arteries, and nerves from the pneumogastric and recurrent trunks, and also from the sympathetic system. The right bronchus, or one of the main divisions of the trachea, is wider and shorter than the left. It enters the lung opposite the fourth dorsal vertebra. The left bronchus is smaller and more oblique than the right, and enters the left lung at the level of the fifth dorsal vertebra. Foreign bodies falling into the trachea most frequently enter the right bronchus, because of the larger size of the latter, and because of the more oblique position of the left bronchus.

*Diseases and Injuries of the Trachea.*— The trachea is liable to inflammation and its products, and frequently suffers from extension of disease from the larynx. Acute inflammation may occur as an idiopathic affection, or a symptom of other disease, as smallpox, measles, typhus, tuberculosis, croup, etc. The symptoms are pain in the windpipe from the top of the sternum, expectoration of mucus, sometimes in regular rings, and a peculiar brazen-like cough. When confined to the larynx there is no hoarseness. Chronic inflammation usually accompanies follicular pharyngo-laryngitis, tuberculosis, and syphilis, and may extend to the submucous tissues and the cartilaginous structures, resulting in ulceration, cicatrization, and stricture. The treatment consists in rest, the application of warm poultices, the inhalation of steam impregnated with balsamic or anodyne substances, and the administration of antiphlogistic remedies. Sulphate of zinc or nitrate of silver may be applied locally with the sponge probang, or the douche. Constriction of the trachea may be produced by aneurismal or other tumors pressing externally on the trachea; or the symptoms may be produced by pressure on the nervous trunk, or the inferior laryngeal fibers. Constriction may also depend on undue muscular contraction, the seat thereof being immediately above the bifurcation of the trachea. Foreign bodies occasionally pass through the larnyx into the trachea, and the accident is a formidable one, which not unfrequently proves fatal. The accident occurs most frequently among children, and is caused by a sudden inhalation while holding something in the mouth. Occasionally, however, a foreign body may, during the act of swallowing and without an inhalation, pass under the epiglottis and into the upper part of the larynx. Foreign bodies in the windpipe may be arrested above the rima glottidis, between the vocal cords, in the cavity of the larynx, or in the trachea. In such cases the patient is suddenly seized with convulsive cough and dyspnœa. The speech is more or less affected, and the breathing is whistling or stridulous; but the diagnosis rests mainly on the sudden accession of the symptoms. When the presence of a foreign body is made out, it ought to be removed at once. When the body is loose in the trachea, a free opening lower down should be at once made, and the opening may be either longitudinal or transversely valvular. It is advisable in nearly all cases to open the trachea, as, by securing a free aperture for respiration, spasm of the glottis is obviated, and the foreign body may be removed through the artificial opening, or it may fall through the glottis into the mouth. Fracture of the trachea occurs from direct violence, and in such cases the wounded part should be laid freely open, so as to secure the passage of air to the lungs. Union of the wound by suture is to be avoided, that by suppurative inflammation being preferable, the head and neck being retained in a suitable position. Foreign bodies in the trachea, and all kinds of injury from external violence, are serious affections, as disease of the lungs is apt to be induced.

**Tracheal Artery,** in anatomy, an artery, or rather a series of arteries, branching off from the inferior thyroid, ramifying over the trachea, and anastomosing below with the bronchial arteries.

**Trachearia,** in zoölogy, a subdivision of the class *Arachnida,* breathing by tracheal tubes. There are two orders, *Adelarthrosomata* and *Monomerosomata.*

**Tracheata,** in zoölogy, a group of *Arachnida,* comprising those which breathe by tracheæ. These are sometimes merged in a larger group of the same name comprising Insecta, Myriapoda, and Arachnida.

**Tracheides,** in botany, pitted cells, furnished with spiral, reticulate, or annular

thickening layers. They occur abundantly in the yew, the lime, and viburnum.

**Trachelias,** in entomology, a group of *Heteromera*, founded by Westwood They comprise all but the *Tenebrionidæ*, and are distinguished by the head being exserted, soft integuments, and varied coloration.

**Tracheliidæ,** in zoölogy, a family of holotrichous *Infusoria*, with three genera, two entirely and one chiefly fresh-water in habitat. Animalcules, free-swimming, ovate or elongate, highly elastic, ciliate throughout; oral cilia slightly larger than those of the general surface; oral aperture at the base of an anterior prolongation.

**Trachelipoda,** in zoölogy, an order of *Mollusca*, established by Lamarck, and divided into two groups: (1) Carnivorous, (2) Feeding on plants. The order was approximately equivalennt to the *Prosobranchiata* of Milne Edwards.

**Trachelium,** throatwort; a genus of *Campanulaceæ*. The species are from the Mediterranean and the Cape of Good Hope Two species, both with blue flowers, are cultivated in gardens in borders.

**Trachelocerca,** in zoölogy, the type gegenus of *Trachelocercidæ*, with four species. *T. olor* (=*Vibrio proteus, V. olor, V. cygnus*, Müll.) is from pond-water, *T. versatilis, T. phœnicopterus*, and *T. tenuicollis* inhabit salt-water.

**Trachelocercidæ,** in zoölogy, a family of holotrichous *Infusoria*, with six genera. Animalcules free-swimming, flask-shaped or elongate, soft and flexible, ciliate throughout; oral aperture terminal or sub-terminal.

**Trachelomonas,** in zoölogy, a genus of *Euglenia* (or, as the family is now generally called, *Euglenidæ*), with several species, mostly from fresh water. Animalcules with one flagellum, plastic and changeable in form, enclosed within a free-floating sheath or lorica; endoplasm green, usually with a red pigment spot at the anterior extremity.

**Trachelophyllidæ,** in zoölogy, a family of holotrichous *Infusoria*, with three genera. Flask-shaped, free-swimming animalcules; ciliate throughout; oral aperture perforating the extremity of the anterior region.

**Trachenchyma,** in botany, vascular tissue consisting of simple membranous, unbranched tubes, tapering to each end, but often ending abruptly, either having a fiber generated spirally in the inside, or having their walls marked by transverse bars arranged more or less spirally. It is divided into three kinds: Spiral, annular, and reticulated.

**Tracheo-branchiæ,** the name given to processes in the larvæ of some aquatic insects, projecting laterally from the somites, and containing tracheæ, which communicate with those which traverse the body. They are in no sense branchiæ, but simply take the place of stigmata.

**Tracheotomy,** the opening of the trachea or windpipe. It may be done in three different positions, viz., between the cricoid and thyroid cartilages, above the thyroid isthmus, and below it, and all three operations are often termed tracheotomy. The operation, through the crico-thyroid interval, is properly termed laryngotomy, that above the thyroid isthmus laryngo-tracheotomy, and that below the thyroid isthmus, tracheotomy. The operation is performed as follows: An incision is made in the middle line, from an inch and a half to two inches, downward from the cricoid cartilage through the skin and deep fascia. Any arteries wounded in this incision being secured, the subcutaneous connective tissue is divided, fold after fold, the large vessels being pressed aside or ligatured when required. The sterno-hyoid and sterno-thyroid muscles are then separated by the handle of the knife, exposing the upper portion of the trachea, which is usually covered by the isthmus of the thyroid gland, which may be drawn up with a hook if it is unusually broad. The trachea should be carefully dissected till three rings are exposed. A sharp tenaculum is then thrust into it, and it is raised somewhat upward and steadied, and then divided from below upward by a sharp-pointed bistoury inserted into one of the interspaces. The completion of the operation is confirmed by the peculiar hissing sound with which the air rushes out of the open wound. The next step is the introduction of the canula, which soon becomes obstructed with mucus, and the inner tube must often be withdrawn for the purpose of cleansing it. The canula must be secured by a piece of tape round the neck, and the edges of the wound above and below the canula may be brought together by stitches or by adhesive plaster. The room in which the patient is confined should be kept warm at a temperature of not less than 80° F., and more or less of an atmosphere loaded with steam should be secured by some means. Tracheotomy may be necessary in cases of disease or injury which produce mechanical impediment to the passage of air from the mouth into the trachea, in cases of foreign substances in the air passages, and in some cases of suspended animation where artificial inflation of the lungs cannot be performed by the ordinary means.

**Tracheotomy Tube,** a tube to be placed in an opening made through the walls of the trachea to permit passage of air to the lungs in case of stricture of the larynx, or

the presence of foreign bodies to the air duct.

**Trachichthys,** in ichthyology, a genus of *Berycidæ,* with four species from New Zealand and Madeira. Snout very short and obtuse; eye large; a strong spine at the scapula and at the angle of the præoperculum; scales rather small; abdomen serrated; one dorsal, with from three to six spines; ventral with six soft rays; caudal forked.

**Trachinidæ,** in ichthyology, a family of *Acanthopterygii Cotto-Scombriformes.* Body elongate, low, naked, or covered with scales; one or two dorsal fins, the spinous portion being always shorter and much less developed than the soft; development of anal like that of soft dorsal; ventrals with one spine and five rays; gill openings more or less wide. The family is divided into five groups, widely distributed: *Uranoscopina, trachinina, pinguipedina, pseudochromides,* and *nototheniina.* Three fossil genera are known: *Callipteryx,* scaleless, from the Eocene of Monte Bolca; *Trachinopsis,* from the Upper Tertiary of Lorca, Spain, and *Pseudoeleginus,* from the Miocene of Licata, Sicily.

**Trachinina,** in ichthyology, a group of *Trachinidæ,* with numerous genera, one of which, *Bathydraco,* is the only deep-sea fish of the family. Eyes more or less lateral; lateral line continuous.

**Trachinus,** in ichthyology, weevers; the type genus of *Trachinina.* Mouth-cleft oblique; eyes lateral, directed upward; scales very small, cycloid; two dorsals, the first short; ventrals jugular, lower pectoral rays simple; villiform teeth in jaws, on vomer, and palatine bones; præorbital and præoperculum armed. Several species, common on the European coasts, absent from the Atlantic, but reappearing on the coast of Chile.

**Trachitis,** in pathology, inflammation of the trachea or windpipe; called also tracheitis and trachealia.

**Trachoma,** a roughness of the eyelids, especially on their inner parts, from scabs, arising from an obstruction of the sebaceous glands. There is a heaviness in the eye, a swelling of the eyelids, with a pain and itching in their corners and in the conjunctiva, and the flow of viscid humor, which sometimes agglutinates the eyelids.

**Trachomedusæ,** in zoölogy, an order of *Hydrozoa,* sub-class *Hydromedusæ,* with the families: *Petasida, Trachynemidæ, Aglauridæ,* and *Geryonidæ.* They are *Medusæ* related to *Hydra,* and have modified tentacles as sense organs. No hydraform stage is known in any member of the group, and in one genus (*Geryonia*) there is direct development from the egg into the medusa form.

**Trachurus,** in ichthyology, an old genus of *Carangidæ,* now generally merged in *Scomber* (the type genus of *Scombridæ*). *T. trachurus* is the horse mackerel. It is about a foot long, or about the length of the common mackerel, and is found in the European seas, at the Cape of Good Hope, in the Indian Ocean, on the coasts of New Zealand and Western America. It appears off the shores of Cornwall and Devon in immense shoals, which are preyed on by a large number of marine birds. Its flesh is far inferior to that of the common mackerel.

**Trachybasalt,** Boricky's name for a group of basalts which he regards as of the latest origin. They are very fine-grained; color, shades of gray; and contain zeolitic substances resembling those occurring in the trachytic phonolites of Bohemia.

**Trachyderma,** in palæontology, a genus of *Annelida,* proposed by Phillips for the casts of membraneous flexible tubes from the Silurian. They are transversely wrinkled or plaited, and though the tube itself has disappeared, there can be little doubt that they were made by annelids.

**Trachydolerite,** a name given by Abich to a rock resembling a trachyte, but intermediate in composition between trachyte and dolerite.

**Trachynotus,** in ichthyology, a genus of *Acronuridæ,* with 10 species, from the tropical Atlantic, and Indo-Pacific. Body more or less elevated, covered with very small scales; mouth rather small, with short convex snout; opercula entire; no finlets; first dorsal consisting of a few free spines. To this genus belong some of the commonest marine fishes; *T. ovatus* ranges over the whole tropical zone.

**Trachyops,** in zoölogy, a genus of *Vampyri,* with one species, *T. cirrhosus,* from Pernambuco. Muzzle shorter than in *Vampyrus,* and with numerous conical warts; nose-leaf well developed.

**Trachypteridæ,** in ichthyology, a family of fishes constituting the division *Tæniiformes* of the order *Acanthopterygii.* Body ribbon-shaped, with the dorsal extending its whole length, anal absent, caudal fin rudimentary, or not in the longitudinal axis of the fish; ventrals thoracic, either composed of several rays or reduced to a single long filament; coloration generally silvery, with rosy fins.

**Trachypterus,** the type genus of *Trachypteridæ.* Ventrals consisting of several more or less branched rays. Specimens have been taken in the Mediterranean, the Atlantic, round the Mauritius, and in the Eastern Pacific. *T. arcticus,* the deal fish, is often met with in the North Atlantic, and specimens are frequently washed ashore on the N. coasts after the equinoctial gales.

**Trachyte,** in petrology, a name originally given by Haüy to a light-colored porous rock, containing glassy felspar (sanidine) crystals, with small amounts of other minerals; a well-known type being that of the *Drachenfels*, of Bonn, Rhine. Subsequently other rocks, having a similar mineral composition, were referred to the original type, but with subordinate names. These were designated by terms which indicated the predominant mineral constituent, hence sanidine-tachyte, oligoclase-trachyte, etc. With the exception of the rocks of a few localities, this word is now used as the name of a group of rocks having certain physical and chemical resemblances in common, but differing considerably in their mineralogical composition.

**Trachytella,** in botany, a genus of *Delimeæ*. Sepals four to five, petals four to five, stamens indefinite, carpels one or two, baccate, many-seeded. The leaves of *T. actæa* are so rough that they are used in Canton for polishing both wood and metal.

**Tracing Paper,** transparent paper which enables a drawing or print to be clearly seen through it when laid on the drawing, so that a pen or pencil may be used in tracing the outlines of the original. It is prepared from smooth unsized white paper rendered transparent by a varnish made of oil of turpentine with an equal part Canada balsam, nut oil, or other oleo-resin.

**Tractarianism,** in Church history, the name given to the Catholic revival in the Church of England which commenced at Oxford in 1833, whence it is sometimes called the Oxford Movement. Two influences prepared the way for Tractarianism, and secured for it a measure of success: (1) the tendency to Rationalism brought about by the study of German theology. (2) The perfunctory way in which a large number of the clergy performed their duties. From the contemplation of these dangers sprang the desire to revive the authority of the Church, and to make her once again national in the widest and deepest sense of the term. The leaders of the movemnt were two celebrated Fellows of Oriel — John Keble and John Henry (afterward Cardinal) Newman, with whom were joined Richard Hurrell Froude, Arthur Philip Perceval, Frederick William Faber, William Palmer of Magdalen, and William Palmer of Worcester, Edward Bouverie Pusey, and Isaac Williams; and one celebrated Cambridge man, Hugh James Rose. On July 14, 1833, Keble preached an Assize Sermon, entitled the "National Apostasy," at Oxford, which so moved Newman, that he arranged a meeting of the clergy named above at Rose's rectory at Hadleigh. Faber, Pusey, and Williams were not present; but Newman broached the idea of "Tracts for the Times," which was adopted, and urged that they should be supported and supplemented by higher pulpit teaching. Of the 90 tracts published in the following eight years, Newman wrote 28, including the famous Tract XC. "Remarks on Certain Passages in the XXXIX. Articles," published in 1841. Pusey contributed tracts on fasting and baptism, and H. E. (afterward Cardinal) Manning wrote No. 3 of the "Songs of the Fathers." Tract XC. raised a tremendous storm in Oxford, and was censured by the Heads of Houses; Dr. Bagot, Bishop of Oxford, wrote to Newman, requesting that the series should come to an end, and no more were published. In 1843 Newman resigned the incumbency of St. Mary's, Oxford, and the chaplaincy of Littlemore, and in September, 1845, was received into the Roman Church, as were others of the tract writers about the same time. With Newman's secession, Tractarianism came to an end, or, more properly speaking, developed into a Catholic section of the Anglican Establishment, with which Pusey and Keble, who remained in the Church of England, were identified. The general teaching of the Tractarians included Apostolic Succession, Baptismal Regeneration, Confession, the Real Presence, the Authority of the Church, and the value of Tradition. The effects of the movement were: (1) A revival and strengthening of the High Church section of the Establishment. (2) An increase of learning, piety, and devotedness among the clergy. (3) The establishment of sisterhoods and other religious and charitable institutions. (4) The development of ritual, as symbolic of Catholic doctrine. (5) The revival of Gothic architecture. (6) A large secession of English clergy and laity to Rome.

**Traction,** the act of drawing a body along a plane, usually by the power of men, animals, or steam, as when a vessel is towed upon the surface of water, or a carriage on a road or railway. The power exerted in order to produce the effect is called the force of traction; the line in which this force acts is called the line of traction: and the angle which this line makes with the plane along which the body is drawn by the force of traction is called the angle of traction. Also the adhesive friction of a wheel on the rail, a rope on a pulley, etc. The tractional surface of a driving wheel is the face of its perimeter.

**Traction Engine,** a locomotive engine for drawing heavy loads on common roads, or over arable land, as in agricultural operations. Some of the earliest locomotive engines, as Murdock's, were designed for this very purpose.

**Tractrix,** or **Tractory,** in geometry, a transcendental curve generated mechanically by a small weight attached to a string, the

other extremity of which is drawn along a fixed line.

**Tract Society.** In the 17th century several traces are found of associations for printing and promoting the sale of religious works, but none of them seems to have existed long. The Society for Promoting Christian Knowledge, founded in 1701, had for one of its objects "the dispersion, both at home and abroad, of Bibles and tracts of religion." In 1750 was formed The Society for Promoting Religious Knowledge among the Poor, not, like the former, confined to the Church of England, but embracing Christians of all denominations. The Religious Tract Society (1799) originated with the Rev. George Burder. Its beginnings were humble, but it soon expanded; translating the Bible and tracts into over 200 languages. In 1825 the American Tract Society was founded and since then it has been publishing books, tracts, and periodicals, representing the best Christian literature approved by all Evangelical Christians, and is the almoner of their gifts to the destitute. Its total issues at home, in 20 languages, number 479,400,000 copies. It has helped foreign missions, in 100 languages, to many millions of copies. Its colporteurs have visited 14,985,116 families.

**Tracy, Benjamin Franklin,** an American lawyer; born in Owego, N. Y., April 26, 1830; was admitted to the bar in 1851; served as district attorney of Tioga county in 1853–1854; and was a member of the New York Legislature in 1861–1862. He raised the 109th and 137th Regiments of New York volunteers in July and August, 1862; took a distinguished part in the operations at the front in 1862–1865, and in the latter year was promoted Brigadier-General of volunteers for gallantry in battle. He was United States district attorney for the Eastern District of New York in 1866–1873; judge of the Court of Appeals in 1881–1882; Secretary of the Navy in the cabinet of President Harrison in 1889–1893; president of the commission which drafted the charter for Greater New York in 1895–1896; and unsuccssful candidate for mayor under the new charter in 1897.

**Tracy, Joseph,** an American clergyman; born in Hartford, Vt., Nov. 3, 1794; was graduated at Dartmouth College in 1814; studied theology and was ordained in the Congregational Church; was secretary of the Massachusetts Colonization Society and of the American Colonization Society for Massachusetts for many years. He was the author of "The Great Awakening, a History of the Revival of Religion in the Time of Edwards and Whitefield" (1842); "History of the American Board of Commissions for Foreign Missions" (1844); "A Memorial of the Semi-Centennial Anniversary of the American Colonization Society" (1867); etc. He died in Beverly, Mass., March 24, 1874.

**Tracy, Roger Sherman,** an American physician; born in Windsor, Vt., Dec. 9, 1841; was graduated at Yale College in 1862, and at the College of Physicians and Surgeons in 1868; became connected with the New York Health Department in 1870; and afterward was sanitary inspector, chief sanitary inspector, deputy register, and registrar of records. He was the author of "Handbook of Sanitary Information for House-holders" (1884); "Outlines of Anatomy" (1889); etc.

**Trade, Board of,** in the United States, a body of men selected from among the business men of a city, and appointed to represent and act for the whole business community in advancing and protecting their interests.

In England, a permanent committee of the Privy Council, presided over by a member of the Cabinet, and divided into seven departments, each having its separate staff: (1) The Harbor Department, which exercises a supervision over lighthouses, pilotage, foreshores, wrecks, quarantine, etc. Included in this department are the standard weights and measures offices. (2) The Marine Department, to which is intrusted the supervision of the registration, condition, and discipline of merchant ships; the superintendence of mercantile marine offices, and the prevention of crimping; the carrying out of the regulations with regard to the engagement of men and apprentices; the examination of officers; the investigation into cases of gross misconduct and wrecks, and generally the carrying out of the business imposed on the board by the various Shipping Acts. (3) The Railway Department, which has the supervision of railways and railway companies, and which must be supplied with notices of application for railway acts, and with plans, before the relative bill can be brought before Parliament. Before a line is opened for traffic it must be inspected and approved by an inspector of this department, and the consent of the board obtained; and notice of the occurrence of any accident must be sent to the department, when, if necessary, an inquiry is held into the cause of the accident. This department has also to keep a register of joint-stock companies, of the accounts of insurance companies, and to prepare provisional orders relating to gas, water, tramways and electric lighting. It also deals with patents, designs, and trade marks, copyright, art unions, industrial exhibitions, and the Explosive Acts (1875). (4) The Financial Department, which has to keep the accounts of the board, controlling its receipts and expenditure. This department has also to deal with

Greenwich pensions, seamen's savings banks, the proper disposal of the effects of seamen dying abroad, wreck and salvage accounts, and the accounts of estates in bankruptcy. (5) The Commercial Department, whose duty it is to advise the treasury and the Colonial and Foreign offices on matters relating to tariffs and burdens of trade, to superintend the carrying out of the Acts relating to bankruptcy, and bills of sale; and to prepare the official volumes of statistics periodically issued, and also special statistical returns for the information of Parliament, chambers of commerce, and private individuals. (6) The Fisheries Department, to which is intrusted the carrying out of the various Acts relating to salt and freshwater fisheries, and the pollution of rivers. (7) The Establishment Department, which deals with establishment questions, copying, postage, etc., and has the care of the library of the board.

**Trade Dollar,** a silver dollar of the United States, containing 378 troy grains of silver and 42 troy grains of alloy. Dollars of this description, issued under Act of Congress of Feb. 12, 1873, were legal tender to the amount of $5. Those issued under the Act of July 22, 1876, possessed no legal tender power. The trade dollars were intended for trade with countries doing business on a silver basis; hence the name.

**Trade Mark,** the name or mark under which any one trades. It is a mode of connecting certain goods in the mind of the public with a particular manufacturer or seller; and its function is to give a purchaser a satisfactory assurance of the make and quality of the article he is buying. A trade mark is the property of the person legally adopting it, and he has a right — antecedent to and independent of the various trade mark acts — to prevent any one else from using it to his prejudice.

Water marks on paper, dating from the 14th century, are among the oldest trade marks. Trade marks appear to have become a prominent feature in the industrial life of England in the early part of the 18th century. The law relating to them has pursued the following course of development. (1) At first no right of property in a trade mark was recognized, and only the actual, fraudulent, and injurious use by one person of the mark of another was restrained and punished. This rule, which originally prevailed both at common law and in equity, was inspired by the old judicial dislike of patent privileges and the failure to see the essential difference between a patent and a trade mark. (2) In 1838, however, in the case of Millington *versus* Fox, Lord Chancellor Cottenham granted a perpetual injunction against the defendant, though no intentional fraud was established. Since that time the English Court of Chancery has uniformly interfered to prevent the infringement of trade marks on the principle of protecting property alone, and it has not been necessary for the plaintiff to prove that the defendant invaded his rights intentionally. (3) The Courts of Common Law did not imitate the wise liberality of the Court of Chancery, and down to 1873 proof of fraud on the part of an infringer was of the essence of a common-law action for damages. The Judicature Act of 1873 provided, however, that in any conflict between the rules of law and of equity the latter should thenceforth prevail; and if actions of infringement were still tried in the Queen's Bench Division, there can be little doubt that the equitable rule would be applied, and proof of fraud dispensed with. (4) But under the judicature acts and the rules of the Supreme court trade mark cases are brought in the Chancery Division, so that the former variance between the Courts of Common Law and the Court of Chancery has now only a historic interest and importance. The owner of a trade mark that is being infringed usually applies for an interlocutory injunction to restrain the immediate infringement, and at the same time brings an action in which he claims (*a*) a perpetual injunction, and (*b*) an account of the profits made by the infringer, or damages in lieu thereof. The fraudulent imitator of a trade mark may be indicted for false pretenses, but not for forgery.

*The Registration of Trade Marks.*— At common law a trade mark could be acquired only by actual user; it must have been "so applied in the market as to indicate to purchasers that the goods to which it was attached were the manufacture of a particular firm." By the English Trade-marks Registration Act, 1875, a Register of Trade Marks was established at the Office of the Commissioner of Patents (now the Patent Office), and it was provided that the registration of a trade mark should thenceforth be equivalent to public user. This provision is in substance repeated in the Patents Acts, 1883–1888, by which the registration of trade marks is now regulated. The registration of a person as proprietor of a trade mark is *primâ facie,* and after five years is conclusive evidence of his right to the exclusive use of the said mark (subject to the provisions of the acts); and no person can institute proceedings for infringement unless the mark alleged to be infringed has been registered, or — in the case of marks in use prior to the Act of 1875 — has been declared by the certificate of the comptroller-general to be non-registrable. For the purposes of the acts a trade mark must contain at least one of the following essential particulars: (*a*) a name of an individual or firm printed, impressed, or woven in some particular and distinctive manner; or (*b*)

Trade Mark

a written signature or copy of a written signature of the individual or firm applying for registration thereof as a trade mark; or (*c*) a distinctive device, mark, brand, heading, label, or ticket; or (*d*) an invented word or words; or (*e*) a word or words having no reference to the character or quality of the goods, and not being a geographical name. There may be added to any one or more of these "essential particulars" any letters, words, or figures, or combination thereof; but the applicant for registration of any such additional matter must in his application state the essential particulars of his trade mark and disclaim any right to the exclusive use of the added matter. But a person need not disclaim his own name or the foreign equivalent thereof; and any special or distinctive word or words, letter, figure or combination thereof used separately and as a trade mark prior to the Act of 1875 is still registrable. A trade mark when registered may be assigned and transmitted, but only in connection with the good will of the business concerned in the particular goods or classes of goods for which it has been registered, and is determinable with that good will. Under the provisions of the International Convention for the Protection of Industrial Property an applicant for registration of a trade mark in any one of the contracting States may obtain protection in any of the other contracting States by application there within three or, in the case of countries beyond the seas, four months from the date of the first application. The subsequent application is antedated to the date of the first, and is consequently not defeated as otherwise it might have been by prior user in the protected interval. In the United States there is a good deal of difference between the laws of the various States on this subject.

*Merchandise Marks.*—Under the Merchandise Marks Act, 1887, which applies to England, Scotland, and Ireland, every person that (*a*) forges, (*b*) falsely applies to goods, (*c*) makes, disposes of, or has in his possession any instrument for forging any trade mark, or (*d*) applies any false trade description to goods is liable, on conviction or indictment, to a maximum period of two years' imprisonment, and on summary conviction to a maximum term of four months' imprisonment with hard labor, or a fine of $100, for the first offense, and in the case of a second or subsequent offense to a term not exceeding six months with hard labor, or a fine of $250. Any person aggrieved by the decision of a court of summary jurisdiction may appeal to quarter sessions. It is a competent defense to a prosecution under the act that the defendant took all reasonable precautions against committing the offense, and gave on demand by, or on behalf of, the prosecutor all the information in his power, or otherwise acted innocently. The limitation for proceedings under this act is the expiration of the three years next after the commission, or the one year next after the discovery of the alleged offense, whichever shall first happen. A conviction under this act does not relieve the defendant from liability to civil proceedings.

*Registration in the United States.*— The following are the regulations for registration for foreign countries: Owners of trade marks used in commerce with foreign nations or with Indian tribes, if such owners be domiciled in the United States or located in any foreign country or tribe which by treaty, convention, or law affords similar privileges to citizens of the United States, may obtain registration of their trade marks by filing in the Patent Office a statement specifying name, domicile, location, and citizenship of the party applying, the class of merchandise, and the particular description of goods comprised in said class to which the trade mark has been appropriated, a description of the trade mark itself, a drawing illustrating it, which drawing must be of a standard size, and a statement of the mode in which the trade mark is applied or affixed to the goods, and of the length of time during which the trade mark has been used. This statement must be signed by the owner of the trade mark and must be accompanied by a written declaration, verified by the person or by a member of the firm or by an officer of the company applying, to the effect that such party has at the time a right to the use of the trade mark sought to be registered and that no other person, firm, or corporation has the right to such use, either in the identical form or in any such near resemblance thereto as might be calculated to deceive; that the trade mark is used in commerce with a foreign nation or an Indian tribe, and that the description and drawing presented for registration truly represent the trade mark sought to be registered.

The fee for examining and registering a trade mark is $25, which includes the certificate. This fee should accompany the application. The certificate of registration is issued in the name of the United States of America, under the seal of the Department of the Interior, and signed by the Commissioner of Patents. It remains in force for 30 years from its date, except in a case where the trade mark is claimed for and applied to an article not manufactured in this country, but receives protection under the laws of a foreign country for a shorter period. In that case it ceases to have any force in this country at the time the trade mark ceases to be protected in the foreign country.

At any time during the six months previous to the expiration of the 30 years the mark may be reregistered for the same term. The right to the use of a trade mark is assignable by an instrument in writing, which

instrument may be recorded in the Patent Office, but said instrument will not be recorded prior to the filing of an application, and it must identify the application by serial number and date of filing, or, where the mark has been registered, by the certificate number and the date thereof. See COPYRIGHT: PATENTS.

**Trade Protection Societies,** associations composed of merchants, tradesmen, and others, formed for the promotion of trade and for protecting the individual members from losses in their business transactions; one of the earliest being the London Association of Guardians for the Protection of Trade, established in 1776. In 1871 the London Board of Trade granted a license for incorporation to one under the Companies Acts, 1862–1867. The operations of these societies used to be confined chiefly to the compilation of registers of bankruptcies, insolvencies, and private settlements with creditors. Each member informed the secretary of the name, occupation, and address of the customers who became insolvent, with the amount of dividend their estate yielded; and latterly, whether the insolvency was due to recklessness and extravagance, or was innocent misfortune. Special attention was directed to the exposure of swindlers and persons who had been guilty of fraud or embezzlement. The information accumulated in the registers, though always accessible to such members as made inquiry at the offices of the society, was kept strictly private from all others. But the extraordinary development of commercial enterprise which took place in the early part of the 19th century added a new stimulus to the trade protection movement. The registers which the societies now printed and circulated among their members contained transcriptions from the following public records — viz., the records of the bankruptcy courts, registers of assignments and trust-deeds, bonds or warrants of attorney, bills of sale, judges' orders, protested bills, and decrees in absence. The societies also undertook to recover past-due bills and accounts for their members, to investigate the circumstances connected with bankruptcies and insolvencies, collect dividends, and perform the general agency business of their members — the whole being done under the direction of a committee appointed for this purpose. Committees were also appointed to scrutinize all measures affecting trade and commerce which might be introduced into Parliament, and to promote legislation favorable to the commercial interest. The sphere of action of trade protection societies thus rapidly widened. The older societies established offices and branches throughout the country; new societies sprang up in the large provincial cities, which in their turn opened agencies and branches in other towns and villages; and the various societies being in communication, the machinery of the whole is available for the purposes of each. In 1852 the various societies formed themselves into an association, which now includes upward of 60 societies. An annual meeting of delegates from all these is held in London, at which matters affecting trade are discussed.

In the United States, especially in the large cities, there are numerous organizations to secure the foregoing results, although much reliance is placed by business men on the reports of the two large commercial agencies.

**Tradescantia.** a genus of lily-like plants, natural order *Commelynaceæ.* The species are natives of America and India, and many of them are cultivated as ornamental plants in flower gardens. They are well marked by their three sepals, three petals, three-celled capsule, and filaments clothed with jointed hairs. *T. virginica,* a North American species, is known by the name of spiderwort. It has succulent stems, shining grass-like leaves, and blue or purple flowers, and it is common in the flower-borders of English gardens. Other species are cultivated.

**Trade Schools.** See MANUAL TRAINING SCHOOLS: TECHNOLOGY, SCHOOLS OF.

**Trades Union,** or **Trade Union,** an organized body of workmen in any trade, manufacture, or industrial occupation associated together for the promotion of their common interests. Specific aims may vary in different unions, but generally speaking the aims of these organizations are the provision and distribution of funds, and by other means to regulate the conditions of labor in the trades included in the society, and the relation of its members with them; to promote the general and material welfare of its members; to assist them when out of work and in distressed circumstances; to support them in case of sickness, accident, superannuation, and loss of tools by fire; to provide for their burial and the burial of their wives; and to aid other trade societies having for their objects, or one of them, the promotion of the interests of workmen. In the United States trades unions are numerous, scarcely any form of labor being without organized association for mutual aid and protection. Of late years there have been almost constant conflicts between organized labor and capital, all over the world, and in the United States the struggle has been particularly severe. See STRIKES and UNIONISM.

Previous to 1824, combinations of workmen were illegal in England, as they still are in most European continental countries. The Trade Union Act (1871) provided for the registration of trade societies, and accorded a certain measure of protection for their funds; but this Act was accompanied

and practically nullified by the Criminal Law Amendment Act. An agitation took place which resulted in the passing of Mr. Mundella's Trade Union Act Amendment Act, in 1876. By this Act every legal grievance of which the unions complained was redressed, and now nearly every trade society in the kingdom is duly registered, and stands in much the same position as any other trade corporation. In the early days of trades unions, one of their most important functions was that of organizing strikes; but of late years there has been a reluctance to resort to such extreme measures. In 1860 a Board of Arbitration was established at the request of the lace workers in Nottingham, and since then similar boards have been formed by the trades in Staffordshire, Middlesborough, Cleveland, Bradford, Sheffield, and other places. In pursuance of the same policy, the Trades Union Congress, in 1874, passed a resolution to the effect that "in all trades where disputes occur, and where it is possible to prevent strikes by starting coöperative establishments, all trade societies and trades councils be recommended to render such assistance as lies in their power, and thus, as far as possible, prevent strikes and lockouts in the future."

**Trade Wind,** in meteorology, in the plural, certain ocean winds, blowing constantly in one direction or very nearly so, can be calculated on beforehand by the mariner, and are therefore beneficial to trade. They exist on all open oceans to a distance of about 30° N. and S. of the equator, blowing from about the N. E. in the Northern, and from the S. E. in the Southern Hemisphere. Where they meet they neutralize each other, creating a region of calm N., and the same distance S. of the equator. Atmospheric air expands by heat, and, expanding, naturally ascends, its place being supplied by a rush of colder and consequently of denser air beneath. The process is continually in progress, to a great extent, everywhere throughout the tropics, but especially above the land. If the globe consisted solely of land, or solely of water, and had no rotation, the cold currents would travel directly from the N. and S. poles to the equator; but the rotation of the earth deflects them from their course. The atmosphere lags behind the moving planet, especially at the equator, where the rotation is about 1,000 miles an hour. Neither the direction nor the area of the trade winds remains fixed. Since they supply the place of rarefied air, which is ascending, they must follow the movement of the sun, blowing to the point of greatest rarefaction, as a cold current coming through a keyhole goes to the fire. Hence, the area of the trade winds extends from two to four degrees farther N. than usual when the sun is at the Tropic of Cancer, and the same number of degrees farther S. than usual when he is at the Tropic of Capricorn. In the former case the S. E. trade wind declines further from the E. from its N. limit, sometimes passing the equator, while the N. E. trade wind approaches an E. direction more than at other times. The region of calms also changes its position. As the difference of pressure is not great, the trade wind is generally moderate in strength, especially in the opposite hemisphere from that in which the sun is at the time. The trade winds were not known till Columbus' first voyage. They are most marked on the Atlantic and Pacific Oceans, where they occur between 9° and 30° N., and between 4° and 22° S. in the former, and between 9° and 26° N., and between 4° and 23° S. in the latter ocean, but become modified in the vicinity of land, so as to lose their distinctive character. In the Indian Ocean, and in Southeastern Asia they become altered into monsoons.

**Tradition,** in its widest signification, whatever is handed down to us concerning the past; and in this sense, all history is tradition. In its more limited sense, any knowledge handed down from one generation to another by oral communication. In the early ages of mankind, before the art of writing was introduced or practised, all history was thus handed down by oral communication. When these came to be written down long after the events had occurred, they partook more or less of the opinions and judgments of those who had handed them down, as well as of those who had written them out. They differ materially, therefore, from events recorded by eye witnesses, or written down at or soon after the time when they occurred. Historians, therefore, distinguish between the two, calling the former tradition, the latter history. Those who have observed how much facts are distorted even in the present day, in passing from mouth to mouth, will understand how carefully the historian has to criticize the accounts that are founded on tradition. The Jews believed that, besides the written law contained in the Old Testament, Moses had delivered an oral law, which had been handed down from father to son, and constituted their tradition, and is contained in the Talmud. In the Roman Catholic Church, the term tradition is applied to the doctrines supposed to have been communicated by Christ to his apostles, and handed down by them orally to their successors. The writings of the Fathers are regarded as containing these traditions; and hence they are considered as equally binding with the doctrines of the New Testament.

**Traducianism,** the doctrine that the human soul, as well as the body, is produced by natural generation. St. Augustine seems to have inclined to this belief

without committing himself to it or, on the other hand, pronouncing in favor of the opinion that the soul was immediately created by God and infused into the embryo when sufficiently organized.

**Trafalgar,** a low and sandy cape on the S. W. coast of Spain, at the N. W. entrance of the Strait of Gibraltar. The famous naval battle in which Nelson lost his life, after defeating a larger French and Spanish fleet under the command of Villeneuve and Gravina, was fought off this cape, Oct. 21, 1805. The Franco-Spanish fleet lost 19 ships out of 33.

**Tragacanth,** in botany, a kind of gum obtained from various species of *Astragalus.* Formerly *A. tragacantha* was considered the chief; but it is now known that this species yields only a gummy juice employed in confectionery. Most of the real tragacanth comes from *A. verus,* a bush about two or three feet high, with pinnate leaves having six, seven or eight pairs of pointed leaflets. The midrib of the leaves terminates in a sharp, yellowish point; the flowers, which are yellow, are in axillary clusters, with cottony bracts. It is a native of Northern Persia, Armenia, and Asia Minor. The gum exudes during summer in tortuous streams, which are allowed to dry on the plant. Other species that furnish it are *A. creticus* and *A. aristatus,* from Greece, the Alps, and the Pyrenees, etc., *A. gummifer,* from Mount Lebanon and Kurdistan, and *A. strobiliferus,* from the latter locality. Senegal tragacanth is obtained from *Sterculia tragacantha,* called also *S. pubescens.* It is a tree about 30 feet high, with deciduous leaves and reddish-brown flowers. It is a native of Sierra Leone and the regions adjacent. Hog tragacanth is the produce of *Prunus amygdalus,* and is imported into Bombay from Persia.

In chemistry, when the true tragacanth (that from the genus *Astragalus*) reaches Europe or the United States, it presents the appearance of dull-white, semi-transparent flakes, waved concentrically. It is tasteless and inodorous, sparingly soluble in water, and is difficult to powder unless raised to a temperature of 120°. It contains two distinct gums, gum arabic and bassorin. It is used in the arts as a glue. Formerly it was much employed in England to stiffen calico, and in France to stiffen and glaze silk. Shoemakers use the inferior kinds to glaze the margins of the soles of boots and shoes. It was formerly called gum dragon.

In pharmacy, tragacanth is used as an emollient and demulcent to suspend heavy powders, the water containing it being more viscous than if gum arabic were employed. There is a compound tragacanth powder which may be given in irritation of the mucous membranes of the genito-urinary organs, pulmonary affections with tickling cough, etc. A thick layer of tragacanth placed over burns is useful in excluding the air.

**Tragedy,** a dramatic poem representing an important event, or a series of events, in the life of some person or persons, in which the diction is elevated, and which has generally a tragic or fatal catastrophe; that species of drama which represents a tragical situation or a tragical character. Tragedy originated among the Greeks in the worship of Dionysus. Thespis first introduced dialogue in the choral odes, and made one entire story occupy the pauses in the chorus. His first representation was in 535 B. C. He was succeeded by Phrynichus and Chœrilus, and is said to have written 150 pieces, none of which has come down to us. Æschylus (525–456 B. C.), added a second actor, diminished the parts of the chorus, and made the dialogue the principal part of the action. He also introduced scenery, and masks for the actors, and is also said to have introduced the custom of contending with trilogies, or three plays at a time. In his later years he added a third actor. Sophocles 495–405 B. C.), further improved the scenery and costume. In the hands of Euripides (480–405 B. C.) tragedy deteriorated in dignity; one of his peculiarities was the prologue, or introductory monologue, in which some god or hero opens the play, telling who he is, what has already happened, and what is the present state of affairs. He also invented tragicomedy. The first Roman tragic poet was Livius Andronicus, a Greek by birth, who began to exhibit in 240 B. C. He was succeeded by Nævius (died 204 B. C.), and Ennius (239–169 B. C.). The only complete Roman tragedies that have come down to us are the 10 attributed to Seneca (A. D. 2–65). The first English tragedy is "Gorboduc, or Ferrex and Porrex," acted in 1562. See DRAMA.

**Tragelaphinæ,** bovine antelopes; a subfamily of *Bovidæ,* with three genera: *Oreas, Tragelaphus,* and *Portax.*

**Tragelaphus,** in zoölogy, the type genus of *Tragelaphinæ* with eight species, ranging over Africa, from the tropics S. The head is peculiarly elongated and narrow; the horns, which are smaller in the female than in the male, are turned abruptly backward at their tips, after having been directed forward and upward in a lyrate manner.

**Tragia** (from Tragus, the Latinized name of an old German botanist, Hieronymus Bock), a genus of *Acalypheæ;* herbs or under-shrubs, often climbing, found in the sub-tropical parts of both hemispheres. Leaves serrate or lobed; male flowers numerous, with a tripartite calyx and three stamens, females with a six-partite calyx and a three-celled, three-seeded ovary. Some

species sting almost like nettles. *T. involucrata*, a shrubby twiner, with the flowers in leaf-opposed racemes, *T. cannabina*, with hemp-like leaves, and *T. mercurialis*, an annual erect plant, named from its resemblance to the dog's mercury, are Indian species, and, like the *T. volubilis* of America, are solvent, diaphoretic, and diuretic. The root of *T. involucrata* is used in India as an alterative in venereal diseases; the fruit, made into a paste, is applied to boils to promote suppuration.

**Tragopan,** a name of certain beautiful birds of the genus *Ceriornis*, and of the family *Phasianidæ*, closely allied to the com-

TRAGOPAN, OR HORNED PHEASANT.

mon fowl. *C. satyra*, a common species, is a native of the Himalayas. The plumage is spotted, and two fleshy protuberances hang from behind the eyes. When the bird is excited it can erect these protuberances till they look like a pair of horns. A large wattle hangs at either side of the lower mandible.

**Tragopogon,** in botany, goat's-beard; a genus of *Scorzonereæ*. Heads solitary, yellow or purple. Involucre single, of 8 to 10 connected scales; pappus feathery, receptacle naked; fruit, slender, muricate, with a long beak. Known species about 20, from Europe, North Africa, and Western Asia. One, *T. pratensis*, the yellow goat's-beard, is only one or two feet high, the leaves alternate, the sheaths much dilated, the involucre eight-leaved, the flowers yellow, closing before noon, the fruit-heads large, the achenes scabrous and scaly, the pappus very feathery, elevated on a long stalk. Found in meadows, pastures, and waste places in the temperate regions of Europe. *T. porrifolius*, the purple goat's-beard, or salsify, is a denizen, rare and local, and is sometimes cultivated. See SALSIFY.

**Tragops,** a genus of whip snakes, with four species, ranging from Bengal to China, the Philippines, Java, and Celebes. Body and tail exceedingly slender, slightly compressed; head depressed, very long, with the snout long and pointed.

**Tragulidæ,** in zoölogy, chevrotains; the sole family of the section *Tragulina*, intermediate in structure between the *Cervidæ* and the *Suidæ*. Owing to the absence of horns and the prominence of their canine teeth, these animals are often wrongly called pigmy musk deer, though they have no musk-secreting gland, nor, except the trivial characters noted above, any special affinities with the genus *Moschus*, with which they were formerly grouped to form the family *Moschidæ*. Of this classification Professor Flower says: "There has scarcely been a more troublesome and obstinate error in zoölogy than in this association of animals so really distinct." There are two genera, *Tragalus*, and *Hyomoschus*. *Hyomoschus crassus* differing only in size from the modern species, has been found in Miocene deposits at Sansan, Gers, France.

**Tragulina,** in zoölogy, a section of selenodont Artiodactyles. Upper canines well developed, especially in males, narrow and pointed; four complete toes on each foot; no frontal appendages. They ruminate, but the stomach has only three distinct compartments, the manyplies, or third stomach, of the pecora being absent.

**Tragulus,** in zoölogy, the type genus of *Tragulidæ*. They are the smallest of the recent *Ungulates*, and in outward appearance resemble the *Agoutis* rather than the rest of the order. The best known species are *T. javanicus*, *T. napu*, *T. kanchil*, and *T. stanleyanus*, from the Malay Peninsula, or the islands of the Indo-Malayan Archipelago; and *T. memmina*, from Ceylon and Hindustan.

**Tragus,** in anatomy, a conical prominence, usually covered with hairs in front of the concha of the external ear, and projecting backward over the meatus auditorius.

**Traill, Catherine Parr (Strickland),** an English writer; born in Kent, England, Jan. 9, 1802. She removed to Canada in 1833, and made her home for many years at Lakefield, Ont. Among her works are: "The Backwoods of Canada" (London, 1835); "Canadian Crusoes" (1852); "Ramblings in the Canadian Forests" (1854); "Afar in the Forest" (1869); "Studies of Plant Life" (1884); "Pearls and Pebbles" (1895); "Cot and Cradle Stories"; etc. She died in Lakefield, Ont., Canada, in August, 1899.

**Traill, Henry Duff,** an English author; born in Blackmeath, England, Aug. 14, 1842; graduated at St. John's, Oxford, in 1864. He was called to the bar in 1868, but soon took to literature. He wrote: "Lives" of Strafford (a very original work with a new view), "William III.," "Sterne," "Coleridge," and others; also "Central Government" (1881); "Recaptured Rhymes" (1882); "The New Lucian" (1884); "Two Proper Prides"; "From Cairo to the Su-

dan Frontier"; "Lord Cromer"; "The New Fiction"; etc. He edited "Social England: A Record of the Progress of the People," in six large volumes; and in 1897 was made editor of the weekly review "Literature." He died Feb. 21, 1900.

**Train, Elizabeth Phipps,** an American author; born in Dorchester, Mass., Sept. 1, 1856. Among her works are: "Dr. Lamar"; "Autobiography of a Professional Beauty"; "A Social Highwayman"; "A Marital Liability"; "A Queen of Hearts"; etc., and translations from the French, "The Shadow of Dr. Laroque"; "Recollections of the Court of the Tuileries."

**Train, George Francis,** an American author; born in Boston, Mass., March 24, 1829; traveled extensively in early life; lectured in Great Britain and Ireland, and after failing to introduce a system of street railways, returned to the United States in 1862. He wrote: "An American Merchant in Europe, Asia, and Australia" (1857); "Young America Abroad" (1857); "Young America in Wall Street" (1858); "Spread-Eagleism" (1859); "Every Man His own Autocrat" (1859); "Observations on Street Railways"; "Union Speeches" (1862); "Downfall of England" (1865); and "Championship of Woman" (1868). He was later chiefly known for his eccentricities. He died Jan. 18, 1904.

**Trajan,** in full, **Marcus Ulpius Trajanus,** Roman emperor; born in Spain A. D. 52; the son of Trajanus, a distinguished Roman commander under Vespasian. He served against the Parthians and on the Rhine, where he acquired so high a character that Nerva adopted him and created him Cæsar in 97. Nerva died in 98, and Trajan, who was then in Germany, peaceably succeeded to the throne. He made peace with the German tribes, and proceeded to introduce enlightened measures of reform into the public service. One of his greatest military achievements was his defeat of the Dacians, and the reduction of Dacia to a Roman province. It is supposed that it was in commemoration of this war that he erected at Rome the column which still remains under his name. In 103 he wrote the famous epistle to Pliny, governor of Pontus and Bithynia, directing him not to search for Christians, but to punish them if brought before him; and on no account to listen to anonymous charges. For some years Trajan occupied himself with the work of administration, but in 114 he set out on an expedition against the Parthians which resulted in the reduction of Armenia to a Roman province. He is said to have been sensual in his private life, but his good qualities as a ruler were such that even 250 years after his death senators greeted a new emperor with the wish that he might be more fortunate than Augustus and better than Trajan. He died in Cilicia in A. D. 117, after having nominated Hadrian as his successor.

TRAJAN.

**Trajan's Column,** a celebrated monument in Rome, Italy, and the *chef-d'œuvre* of Apollodorus; erected by the Roman Senate and people in honor of the emperor in A. D. 114. It still stands in the Forum of Trajan, and is constructed entirely of marble. The shaft is 87 feet high, and whole, including pedestal and statue, 147 feet. Around the column runs a spiral band 3 feet wide and 660 feet long, covered with well-preserved reliefs from Trajan's war with the Dacians, comprising, besides animals, etc., 2,500 human figures, the size of which, 2 feet below, gradually increases upward. Beneath the column Trajan was interred, and on it was placed his statue, for which that of St. Peter has been substituted. A staircase in the interior of 184 steps leads to an open platform at the top. The reliefs, which are reproduced in casts preserved in the Lateran, are invaluable for the light they throw on Roman costume.

**Trajan's Wall,** a line of fortifications in the S. of the Dobrudscha; extends from the Danube, at Czernavoda, to a point on the Black Sea, near Kustendji, a distance of 37 miles. It consists of a double (in some

parts a triple) line of earth ramparts about 10 feet high, bounded on its N. side by a natural fosse formed by a marshy valley, which was long erroneously regarded as an old course of the Danube. The wall was an important defense in the Russo-Turkish war of 1854, and the invaders were twice repelled in attempts to pass it — at Kostelli (April 10), and Czernavoda (April 20–22). A railway was constructed along the route in 1860, and the great cost has been the main obstacle to a project of carrying a ship canal across the valley for the purpose of avoiding the long and difficult passage by the Sulina mouth of the Danube. Another wall of the same name, constructed by a Roman legion A. D. 105–155, stretches from the Pruth E. to the Black Sea, and is included in the territory "restored" to Russia by the treaty of Berlin, July 13, 1878.

**Trajectum ad Mosam.** See MAESTRICHT.

**Trajectum ad Rhenum.** See UTRECHT.

**Trall, Russell Thacher,** an American physician; born in Vernon, Conn., Aug. 5, 1812; settled with his parents in Western New York; studied medicine and in 1840 settled in New York city, where he became a hydropathist. He there established an institution for water-cure treatment in 1843, and 10 years later in connection with it opened a medical school for both sexes. This school was chartered as the New York Hygeiotherapeutic College in 1857. Later he settled in Florence, N. J. He was the author of "Uterine Diseases and Displacements" (1855); "The Alcoholic Controversy" (1856); "Diseases of the Throat and Lungs" (1861); "Pathology of the Reproductive Organs" (1862); "The True Temperance Platform, or an Exposition of the Fallacy of Alcoholic Medication" (1864–1866); "Water-Cure for the Million" (1867); "The Human Voice" (1874); etc. He died in Florence, N. J., Sept. 23, 1877.

**Trammel,** in carpentry, an ellipsograph consisting of a cross with two grooves, which form guides for two pins on a beam compass. The pencil on the beam is directed in a prescribed elliptical path as the pins slide in the grooves. Each pin travels in its own groove, and makes four strokes for each revolution of the pencil. This double reciprocation has occasioned its adoption in machines which require speedy motion.

**Tramway,** a narrow, smooth, continuous track, prepared to form a course in which the wheels of any carriage or wagon, having the gauge of the two parallel lines, may run more smoothly and with less friction than on the surface of an ordinary road. The term is corrupted from Outram, the name of an engineer, who, toward the end of the 18th century, constructed such wheel tracks in connection with colliery and other mine roads in the N. of England. The system is, however, of much earlier origin, continuous wooden tracks having been used in connection with Newcastle collieries more than two centuries ago. About 1765 a development of the system occurred when cross sleepers were laid under the longitudinal planks, which were then raised above the level of the roadway, and, to keep the wagons on the track, the wheels had fixed to them a flange or projecting rim. In 1767, during a period of commercial depression, the Coalbrookdale Company laid down a track of cast iron instead of wood, with the intention of taking it up and selling it at a subsequent period, and this really formed the first iron railway, the prototype of all railways as well as tramways. At a later date rail plates were cast with a flanged edge, so that the guiding flange was transferred from the wheel to the rail. Thereafter many different modifications of both rails and wheels were devised till the forms now generally adopted were evolved. In 1809, a tramway or horse railway was projected between Cheltenham and Gloucester, in England, and subsequently an Act of Parliament was obtained, and a line opened for passenger traffic in 1821.

The system, however, of street tramways, as now established, with grooved rails and flanged wheels, was first proposed by a French engineer, M. Loubat, in the United States, and was there carried out in many of the principal cities. In several Continental towns also the tramway system was introduced before it began to attract much attention in the United Kingdom. In 1857–1858, an American, George Francis Train, made proposals for laying tramway lines in various metropolitan thoroughfares and in several provincial towns. In 1861 an experimental line was laid down by Train in London, but it became the subject of bitter controversy and lawsuits, and after a short existence had to be removed. A similar fate would have befallen Train's lines at Birkenhead and Hanley, had the objectionable rail used by him not been withdrawn and a better form substituted. In 1868 an Act of Parliament was passed sanctioning the laying down of tramway lines in Liverpool; in 1869, after severe contests, three local Acts were passed for London, and since that period the formation of tramways has been sanctioned and carried into effect in all the very large towns in the United Kingdom.

The use of some form of mechanical power on tramway lines in place of horses is a subject which has attracted a great amount of attention, and several kinds of road steamer have been suggested and introduced. The heat generated, the noise, and the appearance of the exhausted steam of the engines, have, however, been the most serious obstacle to the use of steam power on roadways used for ordinary carriage traffic. To

overcome these difficulties Scott Moncrieff, of Glasgow, proposed the use of highly-compressed air, and he devised an apparatus by which a loaded car could travel several miles with one charge of compressed air. A "fireless locomotive" invented by Emile Lamm met considerable success in the United States. In this machine the boiler was charged from a stationary boiler with water superheated to 380° F., whereby an initial steam pressure of 170 pounds is obtained. Messrs. Merriweather & Sons, of London, attained very considerable success in the adaptation of engine power to the propulsion of tramway cars. Steam power has for many years been in use on the Vale of Clyde tramways at Govan, a suburb of Glasgow, the engine being enclosed within a small separate car which draws the passenger car, thus presenting the appearance of two cars, a smaller and larger running together.

In the United States the motive power of what are here called street railroads has been successively horses, under-ground cable, electrical storage battery, over-head trolley, and under-ground electricity. See STREET RAILWAYS.

**Trance,** a condition closely allied to sleep, but differs from it as regards duration and profound insensibility to external impressions. Death trance is, according to Dr. Mayo, a positive status; a period of repose, the duration of which is sometimes definite and predetermined, though unknown. "The basis of death trance is suspension of the action of the heart, of breathing, and of voluntary motion; generally, likewise, of feeling and intelligence; and the vegetative changes in the body are suspended. With these phenomena is joined loss of external warmth, so that the usual evidence of life is gone." Regarding this hypothesis, Dr. Taylor says: "It is obvious that the writer makes no distinction between life and death. All the ordinary phenomena of life may have ceased, and yet, if from any circumstance the decomposition of the body has been retarded, it may be contended that the body is not dead, but simply in a death trance. The entire absence of the ordinary signs of active life is sufficient, according to this physiologist, to prove the absence of life — a proposition which may be granted in reference to a few hours of time, but it would be unreasonable to adopt this method of inquiry, and judge of death by the presence of one sign only, instead of taking these signs in their totality and ordinary sequence." There are no well-authenticated cases on record in which trance has simulated death for any length of time. See CATALEPSY: HYSTERIA.

**Trani,** a town of South Italy, in the province of Bari; on the Adriatic; 95 miles W. N. W. of Brindisi. It is an archbishop's see, has a cathedral, built about 1100, with a Romanesque portal and bronze doors of 1175, the fine church Sta. Maria Immaculata, several convents, a castle, a theater, an orphanage, a high school, a technical school, and a priests' college. Trani has important fisheries, and considerable trade in oil, corn, almonds, figs, and excellent wine. Trani is the ancient Turenum of the Peucetii, and was in the Middle Ages an important seaport. It was taken and burnt by the French in 1779. Pop. (1901) 31,800.

**Tranquebar,** native, Tarangambâdi, a seaport of the Madras presidency, British India; 22 miles N. of Negapatam. A Danish settlement from 1624 to 1807, it passed finally to the English in 1845 for $100,000, and was a busy place till the construction of the South Indian Railway to Negapatam (1861) diverted away its trade. The first Protestant mission to India was established here in 1706.

**Transatlantic Province,** in zoölogy and geography, one of the provinces established for the distribution of marine mollusca. Prof. Edward Forbes divided it into two divisions — the Virginian, from Cape Cod to Cape Hatteras; and the Carolinian, from Cape Hatteras to Florida. The S. division comprises the genera *Conus, Oliva, Fasciolaria, Avicula,* and *Lutraria;* the N. one, *Nassa, Columbella, Ranella, Scalaria, Calyptræa, Bulla, Arca,* and *Solemya.* Called also the Pennsylvanian province.

**Transcaspian Railway,** a noteworthy railway, strating from Uzna Ada on the Caspian, was opened as far as Merv in 1886, to Samarkand in 1888, and by 1900 was extended to Tashkend and Andijan. The Amu-Darya (Oxus) is crossed by a wooden bridge 6,804 feet in length.

**Transcaucasia,** the tract of territory belonging to Russia, and extending between the Caucasus on the N. and Turkey in Asia and Persia on the S. The provinces on both sides of the Caucasus, with the added Armenian districts, constitute Caucasus or Caucasia in the widest sense, and are under one central authority, with 10 minor provinces; but the territory is sometimes divided into North Caucasus, Transcaucasia, and Armenia. Transcauscasia comprises seven provinces; total area 94,182 square miles; pop. 5,516,139.

**Transcendentalism,** in philosophy, a term applied to the Kantian philosophy from the frequent use of the term transcendental by Kant, who gave it a meaning quite distinct from that which it till then bore. The Transcendentalism of Kant inquires into, and then denies, the possibility of knowledge respecting what lies beyond the range of experience. Kant distinguished knowledge into *a priori* (not originating from experience) and *a posteriori* (derived

from experience), thus giving to the phrase *a priori* knowledge a meaning different from that which it had borne in philosophy since the days of Aristotle; and he applied the epithet transcendental to the knowledge that certain intuitions (such as time and space) and conceptions, to which he gave the Aristotelian name of categories, were independent of experience. Necessity and strict universality are for Kant the sure signs of non-empirical cognition. Transcendental philosophy is a philosophy of the merely speculative pure reason; for all moral practice, so far as it involves motive, refers to feeling, and feeling is always empirical.

The word is applied also to the philosophy of Schelling and Hegel, who assert the identity of the subject and object. Their transcendentalism claims to have a true knowledge of all things, material and immaterial, human and divine, so far as the human mind is capable of knowing them.

In theology, the name given to a religious movement in New England in 1839, in which Emerson and Channing took a prominent part. It is thus described in the "Memoirs of Margaret Fuller Ossoli":

"Transcendentalism was an assertion of the inalienable integrity of man; of the immanence of Divinity in instinct . . . On the somewhat stunted stock of Unitarianism, whose characteristic dogma was trust in human reason as correlative to Supreme Wisdom, had been grafted German Idealism, as taught by masters of most various schools — by Kant and Jacobi, Fichte and Novalis, Schelling and Hegel, Schleiermacher and de Wette; by Madame de Stael, Cousin, Coleridge, and Carlyle; and the result was a vague and yet exalting conception of the god-like nature of the human spirit. Transcendentalism, as viewed by its disciples, was a pilgrimage from the idolatrous world of creeds and rituals to the temple of the Living God in the soul."

**Transcendental Analysis.** See CALCULUS, THE INFINITESIMAL.

**Transept,** in architecture, that part of a church which is placed between the nave and the choir, extending transversely on each side, so as to give to the building the form of a cross. The transept was not originally symbolical, but was derived from the transverse hall or gallery in the ancient bascilicas, at the upper end of the nave, its length being equal to the united breadth of the nave and aisles. This accidental approximation to the form of a cross was perceived by later architects, who accordingly lengthened the transept on each side so as to make the ground plan of the church completely cruciform.

**Transfiguration, Feast of the,** a festival instituted in honor of the Transfiguration of Christ (Matt. xvii: 2); is one of the 12 great feasts which come next after Easter in dignity. In the Anglican Church it is only a black-letter feast. It is commonly said to have been instituted in the West by Pope Calixtus III. (1455–1458), but is mentioned in the 9th century. Both Greeks and Westerns keep it on Aug. 6.



**Transformation Myth,** a myth which represents a human being as changed into an animal, a tree or plant, or some inanimate being.

**Transformism,** in biology, the hypothesis that all existing species are the product of the metamorphosis of other forms of living beings; and that the biological phenomena which they exhibit are the results of the interaction, through past time, of two series of factors: (1) a process of morphological and concomitant physiological modification; (2) a process of change in the condition of the earth's surface.

**Transfusion of Blood,** a surgical operation by which blood is conveyed directly from the body of one person to that of another. The earliest case of transfusion of blood on record is that of Pope Innocent VIII., who was unsuccessfully operated on in April, 1492. Various experiments were afterward made by Wren and Lower in the transfusion of blood from one animal to another, and by Denys of Montpellier in injecting the blood of calves into human subjects; but the experiments were not attended with any great success, so that the operation fell into desuetude. This was in great measure due to the fact that the experimenters supposed that, by the transfusion of blood of healthy subjects or of the inferior animals, into the veins of the diseased and enfeebled, disease would be expelled and life prolonged. It was not till about the year 1824, when Dr. Blundell published his work on "Physiological and Pathological Researches," that the transfusion of blood was regarded as a legitimate operation in obstetric surgery; and at the present day the operation is chiefly restricted to cases of profuse hemorrhage in connection with labor, though it is sometimes practised in cases of sudden and profuse hemorrhage from other causes. Cases of intermittent fever have been treated by transfusion in foreign countries, but without any very encouraging results. The operation is best performed by taking blood, instantly before injection, from the arm of a healthy person; but Dr. Brown-Sequard showed that the blood of various animals can be used indiscriminately, provided only certain precautions be taken; and Professor Panum made the important discovery that defibrinated blood is in every respect as well suited for the operation as pure blood. Subsequently Dr. Wagstaffe used milk, and milk mixed with an equal quantity of defibrinated blood, for injecting into the veins. Instead of blood, the following saline solution has been recommended by Dr. Little for injection: Chloride of sodium, 60 grains; chloride of potassium, 6 grains; phosphate of soda, 3 grains; carbonate of soda, 20 grains; distilled water, 20 ounces, the solution being injected at blood-heat.

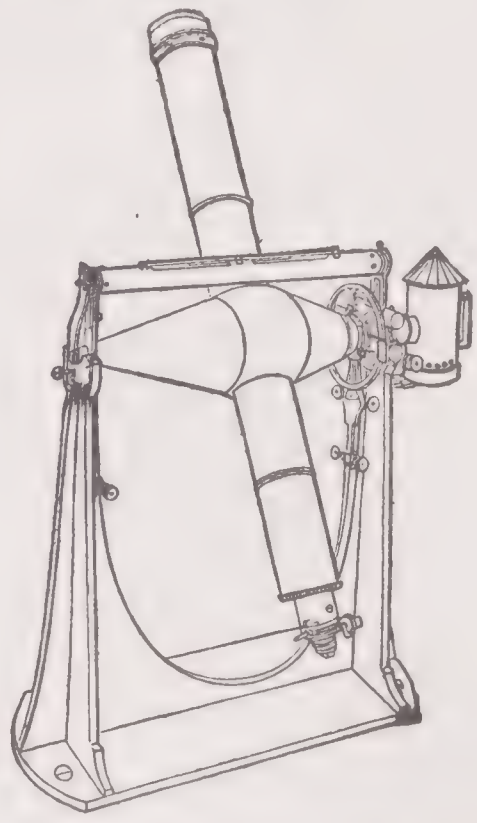
**Transit,** in astronomy, the passage of a heavenly body over the meridian. Also the passage of one of the inferior planets, Mercury or Venus, over the sun's disk, Mercury being so near the sun, and so difficult to observe with accuracy, its transits are not nearly so important to astronomers as those of Venus. In 1716 Dr. Halley published a paper in the "Philosophical Transactions," advising that the transits of Venus over the sun's disk which would occur in A. D. 1761 and 1769 should be taken advantage of for the purpose of ascertaining the sun's distance from the earth. Though he was dead long before these dates arrived, the government of the day acted on his suggestion. In 1769 the celebrated Captain Cook was sent to Otaheite for the purpose of noting the transit, another observer being dispatched to Lapland. The observations of the latter being erroneous the distance of the sun was exaggerated by about three million of miles. In 1874, when the next transit occurred, all civilized nations sent out scientific men to observe it. It was known that it would be invisible at Greenwich, but expeditions were sent out by the British government to the Sandwich Islands, to New Zealand, Egypt, Rodriguez, and Kerguelen Island. Other nations occupied other stations, and the weather proved suitable at most places for accurate observation.

Transits of Venus come, after long intervals, in pairs, eight years apart; and another transit took place on the afternoon of Dec. 6, 1882. In the British Isles the weather was generally unfavorable, clouds with occasional snowflakes obscuring the sky at Greenwich, and through nearly all Great Britain, except on the W. coast. At Dublin, partial observations were obtained; and of various British expeditions sent abroad, complete success was obtained in Madagascar and at the Cape of Good Hope. Observers from the United States and other countries were also successful. The observation of the distance the planet moves to the right and left of the sun, in describing its orbit, enables an astronomer to ascertain the relative distance of the two luminaries. The relative breadth of the sun's diameter as compared with his distance from the earth, is also easily ascertained. If then two observers on the surface of our sphere take their stations at judiciously selected points, as widely apart as possible, and note a transit of Venus, the planet will have a lesser line to traverse at the one place than the other, and will do it in a shorter time. From accurate notation of the difference in time taken in connection with the difference in length it is possible to calculate, first the breadth of the sun, and secondly his distance from the earth. When the materials obtained in connection with the two transits were worked out, it was found, as Hansen had suspected, that the sun's distance had been over-estimated, and it was reduced from 95,300,000, to 92,700,000 miles.

In engineering, a portable instrument resembling a theodolite, designed for measuring both horizontal and vertical angles. It is provided with horizontal and vertical graduated circles, one or two levels, and a compass, and is mounted upon a tripod-stand.

**Transit Circle.** See MERIDIAN CIRCLE.

**Transit Instrument,** an instrument designed accurately to denote the time when a heavenly body passes the meridian. It consists of a telescope supported on a horizontal axis, or pivots, the extremities of which terminate in cylindrical trunnions resting in metallic supports shaped like the upper part of the letter Y, and hence termed the "Y's," and imbedded in two stone pillars. In order to relieve the pivots from friction and facilitate the turning of the telescope, counterpoises are provided operated through levers, carrying friction rollers, on which the axis turns. When the instrument is in proper adjustment, the telescope should continue in the plane of the meridian when revolved entirely round on its axis, and for this purpose the axis must lie in a line directly E. and W. To effect this adjustment its ends are provided with screws by which a motion, both in azimuth and altitude, may be imparted. The telescope has a series of parallel wires crossing its object glass in a vertical direction. When a star, designed to be the subject of observation, is seen approaching the meridian, the observer looks at the hour and minutes on a clock placed at hand for the purpose. He then notes the passage of the star across such wire, listening



TRANSIT INSTRUMENT.

at the same time to the clock beating seconds. The exact time at which the star passes each wire is then noted and the mean between the time of passing each two wires equidistant from the center being taken, gives a very close approximation to the truth. The transit instrument is the most important of what may be called the technical astronomical instruments. The smaller and portable kinds are used to ascertain the local time by the passage of the sun or other object over the meridian, while the larger and more perfect kinds, in first-class observatories, are used for measuring the positions of stars, for forming catalogues; its special duty being to determine with the greatest accuracy the right ascension of heavenly bodies.

**Transition Rocks,** or **Transition Strata,** in geology, an exploded geologic term introduced by Werner, the founder of the Neptunian school of geologists. Erroneously supposing all rocks to have been precipitated from water, he fancied that the primitive or crystalline rocks were first laid down. Then followed strata of a mixed character, partly crystalline and yet here and there exhibiting marks not of a chemical but of a mechanical origin, and possessing besides some organic remains. These rocks constituting, according to this hypothesis, the passage between the primitive and the secondary rocks, were called transition. They consisted chiefly of clay-slate, graywacke, and certain calcareous beds.

**Transition Tint,** in polarization, a purplish-gray, tint caused by a plate of quartz of a certain thickness when examined by polarized light, which, in a certain position of the analyzer, gives the tint between the red of one order of colors and the blue of the next. Hence the least variation converts the tint to either reddish or bluish, making it a sensitive test in the saccharometer.

**Transkei,** a general name given to a region of Southeast Africa N. of the Kei river and S. W. of Natal, and comprising several territories annexed to or under the protection of Cape Colony. These are grouped into the three magistracies of Griqualand East, Tembuland, and Transkei, and the protectorate of Pondoland.

**Translation,** the art of rendering what is written in one language into its corresponding sense in the words of another. To translate perfectly is to interpret to the last detail; and to interpret it is necessary to understand. The feeling is more important than the exact word, and the admonition of Dryden may be commended to the adult translator, if not the schoolboy — not "to lacquey by the side of his author, but to mount up behind him." A literal translation is better than a loose one, but obviously in the case of idioms and metaphors of special meaning the literal rendering cannot be the right one, for in such mechanical transposition the spirit and perfume will be found to have evaporated in the transfusion. "Translation from one language into other," said Don Quixote, "is the looking at Flemish tapestries on the wrong side; for though the figures are visible, they are full of threads that make them indistinct, and they do not show with the smootness and brightness of the right side."

A prose translation of a poem like the "Iliad" or the "Æneid" can be of course only an approximation to the ideal translation, but the Bible, or more strictly the New Testament, loses comparatively little in translation, the language itself being a product of a degenerate stage of Greek, the ideas to be conveyed relatively direct and simple, the matter being much more heeded than the manner. Fortunately for our literature the English translation was made at a time when the language had reached its period of fullest simplicity and vigor.

To lay down canons of translation will not help much in the matter, for the best translators are those who possess an individuality as well as their originals, such as Edward FitzGerald, whose versions from Calderon and Omar Khayyam, wide of their text as they frequently are, yet succeed to perfection in reviving in a sympathetic English reader the effects produced by the original. Hookham Frere's free versions of Aristophanes are perhaps the best things of their kind that have ever been done. The translation ought to be such that the reader should, if possible, forget that it is a translation at all, and be lulled into the illusion that he is reading an original work.

**Transmigration,** in comparative religions, metempsychosis; the doctrine of the passage of the soul from one body into another. It appears among many savage races in the form of the belief that ancestral souls return, imparting their own likeness to their descendants and kindred, and Tylor thinks that this notion may have been extended so as to take in the idea of rebirth in bodies of animals. In this form the belief has no ethical value. Transmigration first appears as a factor in the gradual purification of the spiritual part of man, and its return to God, the source and origin of all things, in the religion of the ancient people of India, whence it passed to the Egyptians, and, according to Herodotus, from them to the Greeks. It was one of the characteristic doctrines of Pythagoras, and Pindar the Pythagorean lets the soul return to bliss after passing three unblemished lives on earth. Plato in the dream of Er deals with the condition and treatment of departed souls; and extends the period of the return of souls to God to 10,000 years, dur-

ing which time they inhabit the bodies of men and animals. Ennius seems to have introduced the doctrine among the Romans. Vergil, Persius and Horace allude to it, and Ovid sets forth the philosophy and preëxistences of Pythagoras. Traces of it appear in the "Apocrypha," and that at least some Jews held it in the time of Jesus seems indicated in the disciples' question (John ix: 2). St. Jerome alludes to the existence of a belief in transmigration among the Gnostics, and Origen adopted this belief as the only means of explaining some Scriptural difficulties, such as the struggle of Jacob and Esau before birth (Gen. xxv: 22) and the selection of Jeremiah (Jer. i: 5). In modern times Lessing held it and taught it; it formed part of the system of Swedenborg and Charles Kingsley seems to have written his "Water Babies" to put on record his belief in transmigration. Figuier deals with the subject in his book, "The Day After Death: Our Future Life, according to Science."

**Transmission of Power,** the doing of useful work at a distance from the engine or whatever other source supplies the energy. An ordinary tow rope evidently fulfills such a function; and in a wide sense all forms of connecting rods, belting, and similar gearing do the same. The revolving shaft of a screw steamer transmits rotary motion through a considerable distance; but for long distance transmission ordinary mechanical devices, if they do not altogether fail, lose greatly in efficiency. In a series of shafts geared one to another by beltings there must be considerable loss through slipping. In the pneumatic dispatch and in boring compressed air has been successfully applied as a transmitter of power. Cable cars also form a good illustration. It is in electricity, however, that we find the most promising agent for indefinite transmission of power. Thus a dynamo-electric machine may be worked by a waterfall; its voltage or potential may be transmitted along wires to distant stations, and there transformed into currents capable of driving an electric motor and keeping a whole factory in operation.

Over 60,000 horse-power of electric current generated by Niagara Falls is in use in the many factories established at Niagara Falls and in Buffalo, N. Y., 26 miles away. In the latter city street railways, grain elevators and manufacturing plants are run by this current, which is brought to the outskirts of the city over bare copper wires, and then distributed through the city in underground conduits. A most remarkable instance of long distance transmission of electric power is that of the electric plant at Cripple Creek, Col. Besides supplying current generated by water power to the mines in the vicinity, covering an area of many square miles, this plant serves current to an electric railway traversing the mining district. The railway, which runs over the mountains instead of around them, is said to be the highest in the world. All through the West and in the coal fields of West Virginia electric transmission plants have been erected, the most of them using either natural or artificial water power for generating the current. Nearly all these plants use bare copper wire for transmission lines.

**Trans-Mississippi and International Exposition,** a fair held in Omaha, Neb., June 1,–Nov. 1, 1898, to exhibit primarily the products, manufactures, and resources of the Middle West. The exposition covered about 200 acres, part of which was along a bluff skirting the Missouri river and giving a view far up and down the valley. Especial attention was given to the development of natural beauties, and the numerous fountains, walks, arbors, small lakes, and flower gardens made an unusually effective setting for the white staff buildings. There were over 20 buildings artistically grouped and connected by vine-shaded arcades; the main buildings alone having an aggregate floor space of 500,000 square feet, exclusive of 200,000 square feet of gallery space. The exposition was a great success, industrially and financially, the total number of visitors being 2,613,374, and the total cash receipts, $1,761,364.18; giving a surplus of $400,000.

**Transparent Burnet,** in entomology, the *Anthrocera minos* (Stainton) or *Zygæna minos* (Newman), a hawk moth, having the fore wings green with three crimson dashes, the hind wings crimson, the posterior margin purplish. Larva pale yellow or greenish, with two rows of black spots on each side. It feeds on bird's-foot trefoil, etc.

**Transplanting,** in forestry, the act of removing bodily a plant or tree from the place in which it grows, and establishing it in the same or another place. The operation is in continual practice in gardens and nurseries throughout the year, and it is of immense practical utility. But for the facility with which the great majority of cultivated plants may be transplanted, gardens would be comparatively profitless, and uninteresting, and pleasure grounds and the landscape be adorned only with indigenous forms of trees, shrubs and flowers. In the large trade nurseries transplanting is one of the chief occupations of the workers. Seedling forest trees are reared annually in hundreds of thousands, and either are transplanted in the nursery to adapt them for special purposes, or are transferred from the seed-bed at the age of one or two years direct to moors and hillsides to form woodlands. Ornamental shrubs from all temperate countries are in the same way prepared

for distribution. Fruit trees are especially benefitted by the process. By frequent transplantings fruitfulness is accelerated in young fruit trees, and the operation is systematically resorted to in order to maintain fertility in those that are more aged.

The operation is most practicable in the youthful stage of all plants. In those that are aged and have been long established in one place it is attended with danger, chiefly because in the case of large trees and shrubs it is impracticable to preserve uninjured a sufficiency of the fibrous roots to draw nourishment from the soil. Yet very large trees have been successfully transplanted. At Chatsworth, Dropmore, and many other places in England, trees exceeding 50 tons weight have been transplanted from one situation to another several miles distant. Such herculean operations in transplanting, while quite practicable, are attended with an amount of expense and hazard which precludes their being generally engaged in. Yet at the places named, and others equally notable, sylvan effects have been created in bleak, treeless situations in two or three years by this means, which would have taken half a century to produce in the ordinary course. In moving trees of a size exceeding that which two or three men may easily handle, transplanting machines are required. These are of various kinds, and each has special merits not possessed by others.

The transplanting of large trees successfully involves the possession of considerable experience of the work by the person superintending it. He should know the proper time or season for the transplanting of each kind of tree with which he has to deal. Various kinds of trees are not all amenable to the same methods. Greater care is required in every stage of the work with some than with others. The prime object to keep in view in every case is the preservation of the fibrous roots; every one of these destroyed lessens the chances of success. When it is determined to transplant trees which have been growing undisturbed for some years, it is necessary to prepare them one or two years prior to lifting them. A trench is opened in a circle 2, 3, or more feet — according to the age and size of the tree — from the bole all round, and all the roots are cut off beyond the circle. The trench is carried deep enough to reach all the roots, and is then filled up either with the earth excavated or, in cases requiring special care, with soil of a kind more favorable to the formation of fibrous roots. The mutilated roots send out new feeders into the new soil, and if the work has been properly done they will be numerous enough one or two years hence, according to the peculiarities of the subject, to bind the new soil in a compact mass, and thus facilitate

Transplanting

the transportation of a considerable ball of earth along with the tree.

Limes, poplars, willows, and such-like quickly-growing and free-rooting trees are more easily transplanted when of considerable age than oak, beech, sycamore, and the like. Evergreen trees and shrubs transplant most successfully in spring, when they are beginning to grow. Deciduous subjects on the other hand succeed best when transplanted immediately after the fall of the leaf. Surrounding the roots with light compost and watering, and mulching the area over which the roots extend to lessen evaporation, are ordinary but essential means to success, especially in the case of large and difficult subjects. Securing the tree at once against disturbance by wind after it is planted is of vital importance.

**Transplanting,** in surgery, the removal of a substance from one part of the human body to another or from one person to another. Modern surgery has, within recent years, been very fertile in discoveries in this line of operations. Professor Nussbaum, of Munich, in 1875, described an operation for the loss of bone which he denominates transplantation of bone. It consists of cutting off from the rest of the bone a portion of its external shell, covered by the periosteum, and leaving this shell of bone attached to the remainder by means of the periosteum covering its terminal extremity. This semi-attached bone is displaced into the gap in the same way as a flap of skin is twisted in a plastic operation, and fixed in the indurated soft tissues of which the gap is formed. The operation was first performed in a case of non-union of the ulna, the result of loss of bone from a gunshot fracture. Attempts have also been made to transplant periosteum which may form the nidus of bone. The transplanting of skin, now a very common operation, may be effected by displacement, or by torsion. The first mode is effected by dissecting up a piece of skin, of the required size and shape, a portion of it being left attached. The loose portion is then shifted into the part where it is intended to lie. In the method by torsion, the position of the flap of the skin is changed, and the neck of skin, forming the attachment, is made as slender as is consistent with the maintenance of vitality. In both cases the edges of the transplanted skin are brought into close contact by means of stitches, with the cut edges of the skin where union is desired. Transplanting of skin can be effected from one part of the body to another, as from the arm to the nose, or from the thigh to the hand.

Transplanting of skin, by grafting, was invented by M. Reverdin of Geneva, in 1869, and was introduced into British surgery by Dr. Pollock, in 1870. This operation is peculiarly adapted to cases where large gran-

ulating surfaces are exposed, as in cases of extensive burns. It is essential that the granulations should be perfectly healthy, and that all irritation in the sore should have ceased. The operation may be performed with a pair of fine forceps and sharp curved scissors. A small portion of skin, hardly larger than a pin's head is snipped off with the scissors. The whole thickness of the skin should not be cut through, but only a small portion of it, so as to make sure of removing the rete mucosum, as the growth of the graft seems to depend on the cells of the rete Malpighii. The grafts are placed firmly on the granulations, about an inch apart, and are covered with oiled silk, moistened with oil to prevent its sticking when removed, and the whole is fixed with strapping and covered with cotton wool. The dressing should be removed in three or four days. The grafts first change into little, round, vascular-looking buds; and in a short time the new cuticle is seen extending in all directions from the bud. That the new skin is due to the graft is evident from the fact that a graft from a negro placed on a European produces a dark-colored skin; and a graft from a European transplanted on a negro produces a white portion of skin.

**Transpiration,** in chemistry, the diffusion of liquids, vapors, and gases through a capillary tube. The transpiration of liquids was first examined by Loiseville, but little was discovered beyond the fact that when different liquids were pressed through tubes of equal size, with identical forces, the times of the passage of similar quantities differed considerably, but no connection could be traced between these differences. Graham has, however, made a series of experiments on the transpiration times of certain acids, salts, and other substances, in different stages of dilution. Thus nitric acid, with three equivalents of water, is found to have a lower rate of transpiration than when diluted more or less, and a certain steadiness was observed on each side of the maximum of retardation. With sulphuric acid the maximum retardation occurred when one equivalent of water had been added, or, in other words, when the crystallizable hydrate had been formed. Acetic acid gradually rose till the bihydrate was formed, which is the characteristic hydrate of that acid. With hydrochloric acid the retardation seemed to take place when the dodecahydrate was reached. The transpiration time of ordinary alcohol reached its maximum at the hexahydrate. The different alcohols and ethers were also tried against each other, and their transpiration times were found to increase with their boiling points. From these facts a distinct rotation appears to exist between the transpirability of liquids and their chemical compositions. Temperature has a great influence on the transpirability of fluids; for example, water at 113° F. escapes through the same tube with 2½ times the rapidity that it does at 41° F. The rates of transpiration are entirely independent of their rates of diffusion. No connection has as yet been found between these differences or similarities. Thus the velocities of nitrogen, binoxide of nitrogen, and carbonic oxide, are equal. Equal weights of oxygen, air, nitrogen, and carbonic oxide, are transpired in given times. The velocity of hydrogen, a light gas, and the heavy vapors of ether are equal. The laws regulating the transmission of gases and vapors through capillaries have yet to be investigated.

**Transport,** a ship or vessel employed by a government for carrying soldiers, warlike stores, or provisions from one place to another. At the beginning of the American-Spanish War the United States had no ships of this class. A number of coastwise crafts were purchased and hastily transformed into transports on which troops were shipped to Manila and other points. Although so hastily fitted up, they proved adequate. When the war closed the United States government fitted up a number of these vessels as model transports. They have every convenience and comfort, including gymnasiums, bathrooms, hospitals and electric lights, a distilling apparatus, and a large refrigerating plant. The space between decks is supplied with cooled air from a large ventilating plant.

**Transportation,** a punishment till recent times in general practice in Great Britain for crimes of the more serious description, but falling short of the penalty of death. It varied in duration from seven years to the termination of the criminal's life according to the magnitude of the offense. Australia, Tasmania, and Norfolk Island were the stations to which convicts from England were conveyed. Transportation was abolished by an act passed in 1857, and superseded by penal servitude. This act, however, reserved to the privy-council the right of ordering convicts to be transported, and it was only in 1868 that transportation to Western Australia actually ceased.

**Trans-Siberian Railway,** a railway system of Russia, extending from St. Petersburg to Port Arthur. The entire distance from St. Petersburg to Vladivostok is 6,677 miles; the fare, first-class, $128.75, second-class, $87.55, third-class, $46.35; and the time of the journey about 27 days, which is being steadily reduced as new facilities are added. The road was originally built with light rails — some of which weighed only 12 pounds to the foot — wooden bridges, light equipment, cars without trucks; and

in many cases the track was laid on marshy soil. As a consequence, it has been impossible to make time, or take care of the business offered. These defects, however, are being remedied as rapidly as the means can be provided to meet the expenses, which in some sections will amount to 50 per cent. of the original cost, which was $172,525,000.

The construction of the Trans-Siberian railway was carried through under most adverse climatic conditions, and in the face of great natural difficulties. The first sod was cut at Vladivostok, on May 24, 1891. To facilitate the work of construction, the line was divided into three parts. The first started from the European frontier in the Ural, and ran E.; the second from Vladivostok, on the Pacific, ran W.; while the third, the middle section, near Lake Baikal, joined the other two. The whole line was open for passenger traffic in December, 1901.

The importance to Russia of this new road cannot be overestimated. Before its construction the mobilization of troops at any given point would have taken weeks, while now it can be accomplished in comparatively few days. Politically, it unites the various provinces, and brings the whole country from St. Petersburg to Vladivostok into direct touch with the central government. For the interior of Russia the opening of the railroad means that the resources of the East are at her disposal, and that she can deliver in the East her own products at a great advantage over her Western rivals. Business men throughout Europe will benefit by the mail service over the new railroad, which will deliver letters in 16 or 18 days, in place of the month or five weeks now required; and the Russian merchants will enjoy the advantage of quicker communication and nearness to their new markets.

**Transubstantiation.** The meaning of the theological term transubstantiation is made apparent in the following canon of the Council of Trent: "If any one shall say that, in the most holy sacrament of the Eucharist, there remains the substance of bread and wine together with the body and blood of our Lord Jesus Christ; and shall deny that wonderful and singular conversion of the whole substance of the bread into the body, and of the whole substance of the wine into the blood, the species of bread and wine alone remaining — *which conversion the Catholic Church most fittingly calls transubstantiation* — let him be anathema." The canon quoted was intended as a condemnation of the theories of impanation and consubstantiation. According to the theory of impanation, which was advocated chiefly by Osiander, in the sacrament of the Eucharist the bread and wine were hypostatically or personally assumed by the Divine Word.

Transubstantiation

According to the theory of consubstantiation, which was favored by the large majority of the Lutherans, the substance of the bread and wine remain together with the body and blood of Jesus Christ, but without being hypostatically assumed.

The doctrine of transubstantiation is then an article of Roman Catholic faith. Furthermore, the Council of Trent in the same Session xiii. declares that this doctrine "has always been the conviction in the Church of God." Protestant divines call in question the truth of this declaration, and assert that the doctrine was unknown before the Middle Ages. Roman Catholic theologians on the other hand, while admitting that the term transubstantiation is comparatively new, profess their ability to prove by a catena of witnesses, commencing with the earliest ages of the Church, that the doctrine conveyed by the term has been believed from the first. That the term is comparatively new is unquestionable. Cardinal Franzelin, indeed ("De Eucharistia," p. 177), gives instances of its use by Catholic writers in the 11th and 12th centuries. Nevertheless it was not formally adopted into the doctrinal phraseology of the Church before 1215, when it was employed in a profession of faith drawn up by the fourth Lateran Council. After this period we find the term again employed in a "confession of faith," which was presented for subscription to Michael Palæologus, the Greek emperior, by Pope Clement IV. (1267), and was professed by the emperor in the second Ecumenical Council of Lyons held in 1274 under Pope Gregory X.

That the doctrine conveyed by the term transubstantiation is at least much older than the term all historians must admit. Berengarius of Tours, who had attacked the prevalent teaching on the Eucharist, was required by a council held in Rome under Pope Gregory VII. (1079) to make the following profession of faith: "I, Berengarius, believe in my heart, and profess with my lips, that the bread and wine which are placed on the altar are *substantially changed into* the true and proper and life-giving flesh of our Lord Jesus." And in the largely attended council held at Piacenza (1095), seven years after the death of Berengarius, it was once more declared that "the bread and wine, when they are consecrated on the altar, are *truly and essentially changed into* the body and blood of our Lord." In a treatise "On the Sacrament of the Body and Blood of Our Lord Jesus Christ," written by Paschasius Radbertus (831), the author very plainly stated the doctrine of transubstantiation. Some of the views expressed in this treatise were traversed by Rabanus Maurus, Ratramnus, and other contemporary writers; but the

Transubstantiation

author's teaching on transubstantiation was challenged by no one.

It is admitted, with more or less of unanimity, that from the days of Paschasius Radbertus down to the period of the Reformation the doctrine of transubstantiation was in general acceptance. But when the inquiry turns on the belief of the early fathers this unanimity disappears. Catholic theologians assert that the expressions employed by the Greek and Latin fathers, when treating of the effect of the Eucharistic consecration on the substance of the bread and wine, are irreconcilable with any theory of transubstantiation. Leibnitz is disposed to grant the truth of this contention: "The records of pious antiquity," he writes, "plainly enough demonstrate that the bread is changed into the body, and the wine into the blood of Christ; the ancients, too, universally acknowledged therein a change of substance, which the Latins have aptly rendered transubstantiation" ("System of Theology"). But in making this concession Leibnitz parts company with the great majority of Protestant divines. The latter contend that the change indicated by the language of the fathers is not a change in the substance of the elements, but a change in their use, efficacy, and dignity.

Transubstantiation is a doctrine not only of the Roman Catholic, but also of the Greek Church. In 1643, as a protest against the Calvinist "Confession of Faith," which had been drawn up by Cyril Lucaris, and circulated among the Christians of the East, and with the view of preventing any further attempts to unite the Reformed and Greek Churches, a "Profession of Orthodox Faith" was formulated by Peter Mogilas, archbishop of Kieff and primate of all Russia, and was subscribed by Parthenius, patriarch of Constantinople, Joannicius, patriarch of Alexandria, Marcarius, patriarch of Antioch, Paisius, patriarch of Jerusalem, and the other metropolitans and bishops of the Greek and Russian Churches. This profession, which is divided into "Questions," treats from question 98 to question 119 of the seven sacraments, explaining the use, nature, sanctity, and efficacy of each. Under question 107 the doctrine of transubstantiation is distinctly enunciated as follows: "When these words (of consecration) are pronounced, immediately transubstantiation takes place; the bread is transubstantiated into the true body of Christ, and the wine into the true blood, the species alone remaining." At the Synod of Jerusalem, held (1672) under the presidency of the patriarch Dositheus, this profession was solemnly confirmed as the expression of the faith of the entire Eastern Church.

Transubstantiation differs from all natural changes in this, that natural changes, even though they may be substantial changes,, such as, *e. g.*, the conversion of food by the processes of assimilation into the substance of the person nourished, or the conversion of wood into ash by the action of fire, are, at most, transformations. When, *e. g.*, wood is converted into ash, the form or active principle which made the original substance to be wood gives place to a form that makes the substance, which is the term of the change, to be ash. But the matter or passive principle, which before the change was the subject or recipient of the substantial form of wood, remains after the change as the subject or recipient of the substantial form of ash. And thus in all natural changes, even though they be substantial, there is not an entire but only a partial change of substance. The active principle of the original substance is changed, but the passive principle remains. In transubstantiation, however, both the matter and the form of the bread and wine are changed, for, according to the Tridentine definition, there is a "conversion of the whole substance of the bread into the body (of Christ) and of the whole substance of the wine into the blood."

Another respect in which transubstantiation differs from all natural changes is indicated by those other words of the Tridentine definition, "the species of bread and wine remaining." By species is here meant accidents. As accidents have no existence of their own, but exist with the existence of the substance in which they inhere, it follows that when that substance is destroyed its accidents must in the ordinary course of things cease to be. Thus, *e. g.*, the external manifestations and the active and passive qualities of wood do not exist after wood has been converted into ash. But in transubstantiation the external manifestations, such as shape, color, flavor, odor, etc., the passive powers of corruption, etc., the active powers of nutrition, etc., and the other forces and characteristics of bread and wine, continue to exist and to operate after the destruction of the substances on which they naturally depend. To hold, as Magnan and other Cartesians have done, that these accidents remain as mere phenomena and subjective impressions, void of objective reality, is to hold what is in opposition not only to experience, but also to the common teaching of the Catholic Church, as expressed, *e. g.*, in the "Catechism of the Council of Trent," part ii, chap. 4, q. 43.

But though the accidents persist after the subject in which they naturally inhere is withdrawn, they do not acquire the mode of being which is proper to substance, for they exist not *per se*, but by the "extraordinary concursus" of God, and, while not actually existing in substance, they still retain an essential relation to substance as their subject. S. Thomas Aquinas, holding with Aris-

totle that extension is the "first disposition" of matter, and that all other accidents in consequence are referable to material substance "through the medium of extension," is of opinion that the extension of the bread and wine receives from God the power to act as the "quasi subject" and support of those other qualities of bread and wine which manifestly exist and operate after transsubstantiation has been effected.

**Transvaal, The,** formerly the South African Republic; later a British colony; since May 31, 1910, a province in the Union of South Africa; lying between the Vaal and Limpopo rivers; area, 113,642 square miles; pop. (1904) 1,354,200, of whom 300,225 were whites, 1,030,029 aborigines, and 23,046 of other colored races; chief towns, Johannesburg, pop. 220,304, and Pretoria, pop. 15,539. Prior to its annexation to Great Britain, the republic was ruled by a president elected for five years, only native Boers having the franchise; and a legislature of two houses, each of 27 members, elected for four years. The president had a council of four official members. One-third of the population is estimated to be engaged in agriculture, the lands of the region generally, outside the mining districts, being extremely productive, and the demand for farm products in the mining regions very great, even in excess of the local products at the present time. From the establishment of the republic troubles arose with the natives around them, and during one of these disturbances the British intervened in 1877 and annexed the territory. The Boers, however, rose in rebellion in 1880, and after a short war, in which the British were worsted, the independence of the country, subject to the "suzerainty" of the British crown, was again recognized. In 1884 a new convention was signed giving the Transvaal independence in the management of its internal affairs; but placing certain restrictions on its authority to make treaties with foreign powers. In 1886 gold was discovered in the RAND (*q. v.*).

In 1899 trouble again arose between the Transvaal government and the Uitlanders. The latter sent numerous petitions to the Queen of England to help them in their contentions against the Boers. A conference was arranged between President Krüger and Sir Alfred Milner, the British high commissioner at Cape Town, which was held May 31, 1899, at the capital of the Orange Free State; but it failed to yield any benefits as Krüger declined to make the so-called "reforms" that Milner demanded, and Milner declined to submit disputes to international arbitration in the way Krüger suggested. The chronic source of trouble in the Transvaal was the fact that the Englishmen who went there for gold-mining purposes were determined on obtaining the right to vote as citizens of the Transvaal republic, while still keeping their status as British subjects.

On Oct. 10, 1899, the Transvaal government sent an ultimatum to Great Britain demanding the withdrawal of all her troops in the Transvaal. The reply to this being unsatisfactory, the Transvaal declared war Oct. 11, 1899, the Orange Free State supported its sister republic, and the next day a Transvaal force invaded Natal. The first months of the war were marked by Boer aggressions and successes. At the close of 1899 three British forces were being besieged, respectively at Ladysmith, Kimberley, and Mafeking, and three British armies had been checked and were inactive, awaiting the arrival of reinforcements. The British losses had been 7,630 in killed, wounded and missing. These unexpected reverses awoke Great Britain to the magnitude of the task before her. Lord Roberts and Lord Kitchener and 100,000 men were dispatched to South Africa and by the end of January there were 250,000 British troops in the field. Before the arrival of these troops, however, the Boers continued to gain victories. At the Tugela river and at Spion Kop (a small hill N. of the river) the British were defeated and compelled to relinquish their plan of relieving Ladysmith.

With the arrival of Lord Roberts at the front, Feb. 9, the aspect of the war changed. Lord Kitchener reorganized the army and departments; Lord Roberts began the invasion of the Orange Free State; and in rapid succession followed the relief of Kimberley (Feb. 15); the surrender of General Cronje with 4,600 men (Feb. 27); the relief of Ladysmith (Feb. 28); the surrender of Bloemfontein, the capital of the Orange Free State; the relief of Mafeking (May 16); and the surrender of Pretoria (June 5). On Sept. 8, at Spitzkop, General Buller defeated a large force of Boers under General Botha, and with this battle organized resistance came to an end. President Krüger fled to Europe, and the only opposition offered the British was by isolated bands of Boers who carried on a guerilla warfare. On Sept. 3, the South African (Transvaal) republic was officially annexed by Great Britain under the name of the Transvaal Colony, and on Dec. 14, Sir Alfred Milner was appointed its administrator. In January, 1902, the government of the Netherlands made official overtures to Great Britain to act as a peace intermediary between her and the Boers. Great Britain refused the offer on the ground that any conditions of peace must be made in South Africa, and not by the Boer representatives in Holland. See SOUTH AFRICAN WAR.

**Transvaal War,** a war between the (then) South African Republic and Great Britain in 1880–1881. The Boer victory at

Majuba Hill, Feb. 27, 1881, was soon followed by peace.

**Transylvania,** a former grand-duchy and crown-land of the Austro-Hungarian monarchy; now the S. E. part of the kingdom of Hungary; surrounded by Hungary, the Bukovina, Moldavia, and Wallachia; area, 21,518 square miles; pop. (1900) 2,456,838. Transylvania is so called from its position beyond the wooded Carpathians; its interior is a table-land intersected by spurs from the Carpathian ranges, rising in the S. (in Negoi) to 8,060 feet, in the N. to 7,000, in the W. to 5,840, and in the E. to 5,700, while its average elevation is about 1,500 feet above the sea, its lowest point being where the river Maros enters Hungary (566 feet). The chief rivers, all belonging to the Danube system, are the Aluta, falling into the Danube, Samos, and Maros (tributaries of the Theiss), and the Bistritz, an affluent of the Sereth. Of the whole area, 23 per cent. is arable, 25 per cent. meadowland, and 38 per cent. forest. The best wine is produced in the valleys of the Samos, Kotel, and Maros. The mining industries of Transylvania include the production of iron ores, and pig iron. Other mineral products are gold, silver, quicksilver, copper, coal, and salt. Tanning and the manufacture of linens, woolens, and glass, are also important. Originally a part of Dacia, Transylvania was conquered by King Stephan I. in 1004, and united to Hungary. About this period the country was invaded by Germans, probably from the Rhine districts, who named it Siebenbürgen, after the seven fortified towns built by them. Ever since this little Saxon colony has retained, unchanged its peculiar laws and language; here we find cities with names like Kronstadt, Hermanstadt, Klausenburg, Elizabethstadt, and Mühlenbach, in a district surrounded by places with Slavonic, Magyar, and Wallachian names. From 1526 to 1699 Transylvania was an independent kingdom under the Zapolya princes. Completely subdued by Leopold I. in 1687, and united to Hungary in 1713, it became a grand-duchy in 1765. In 1848, it was the theater of a bloody struggle between Bem and the Russians, and was for a time united to Hungary. In 1849 it became an independent crown-land of Austria, and in 1867 an integral part of the kingdom of Hungary.

**Trap,** a term rather loosely and vaguely applied by the earlier geologists to some or all of the multifarious igneous rocks that belong to the palæozoic and secondary epochs, as distinct from granite on the one hand, and the recent volcanic rocks on the other. Trap rocks often assume a terraced appearance, whence their name from trappa, the Swedish for stair. Their composition may be described as consisting chiefly of felspar and hornblende. Trap rocks of crystalline structure are distinguished as greenstones, basalts, clink stones, compact felspar, and felspar porphyries; while the softer and more earthy varieties are known as claystones, claystone porphyries amygdaloids, trap tuffs, and wackes. BASALT (*q. v.*) is the most compact, the hardest, and the heaviest of the trap rocks. The hill scenery of trappean districts is often picturesque.

**Trapa,** in botany, the water caltraps, the sole genus of *Trapeæ;* floating plants, with the petioles tumid in the middle, and clustered leaves, those under water cut into capillary segments. Calyx superior, four-parted; petals four; stamens four; ovary two-celled, each cell with one pendulous ovule. Fruit hard, indehiscent, one-celled, one-seeded; seed large, without albumen; the cotyledons very unequal; the kernel of the fruit largely consists of pure starch. Known species, four. They are found in temperate Europe, Siberia, India, Cochin China, etc. *T. natans* has four spines on its fruit, and is large and black. It is the tribulus of the Romans, and the nuts are sold in the markets of Venice (where they are known as Jesuit's nuts) and other parts of Italy and in France. They are made into bread. *T. bispinosa* has only two spines or horns on its fruit. It is found in tanks and pools throughout India. Its nuts are dark-brown and triangular. Their kernel is white and sweetish, and is eaten, both raw and cooked, and made into cakes by the Hindus. Many of these plants grow on the Wular Lake, a large sheet of water, about 40 miles in circumference, on the Upper Jhelum, in Kashimir, the old traveler, Moorcroft, declaring that the nuts from the lake furnish almost the sole support of 30,000 people for five months of the year. Moorcroft and Dr. Royle say that under the government of Rungeet Singh, $60,000 of revenue was raised from the trapa, amounting to from 96,000 to 128,000 ass loads, taken from the lake. The natives consider the nuts as useful in bilious affections and diarrhœa, besides applying them externally as poultices. The plant is called by the natives *Singhara* = horned, referring to the fruit. Another less-known East Indian species is *T. quadrispinosa,* introduced into Europe as a stove plant in 1823. *T. bicornis,* called by the Chinese ling, or linko, has the two horns recurved and very obtuse. It is cultivated by them in lakes, ponds, etc.

**Trapani,** a coast town in the W. of Sicily; 23 miles W. of Palermo. The cathedral of St. Lorenzo, a town house, a lyceum, and a library are the chief public buildings. The town is well built, strongly fortified, and has a good natural harbor. The manufacture of sea salt is the chief industry, but corn, wine, fish, and coral are also exported. Trapani is the ancient

Drepanum or Drepana. It was fortified by Hamilcar in 260 B. C., and here in 249 Adherbal defeated the Roman fleet. Near it is Mount Eryx, now Monte S. Giuliano. Important discoveries of human and other bones in caves were made in 1869. Pop. (1901) 59,452.

**Trapdoor,** a door in a floor or roof, which when shut is flush or nearly so. Trapdoor spider, in zoölogy, a popular name for any species of *Mygalidæ,* which constructs a tubular nest in the earth closed by a more or less perfect door or doors. Moggridge enumerates nearly 48 species from Europe and the borders of the Mediterranean, of which only one, *Atypus sulzerii,* is British. He divides the nests into six separate types, according to the kind of door present, the straightness or divarication of the tube, and the presence or absence of a second door in the tube below the surface of the earth. *A. sulzerii,* nearly half an inch in length, excavates a more or less cylindrical gallery, about half an inch wide, in moist ground, at first in a horizontal and then in a vertical direction. This gallery is lined with a tube of silk, but, instead of closing the aperture with a trapdoor, the spider continues the lining tube beyond the mouth of the gallery for some distance on the surface of the ground. *Cteniza fodens,* common in the S. of Europe, closes the entrance to its nest with a trapdoor composed of earthy particles firmly held together by layers of silk. Other species make more elaborate dwellings either by constructing a second door in the vertical tube, or a second tube branching off from the first.

**Trapezium,** as defined by Euclid, any quadrilateral except a square, an oblong, a rhombus, and a rhomboid. Later Greek geometers seem to have used the word in the more restricted sense of a quadrilateral with one pair of parallel sides; and the word trapezoid was introduced to describe a quadrilateral which had no two sides parallel. On the Continent the words are so distinguished to this day. By English geometers and writers on mensuration the words got interchanged as regards their significance, so that with us a trapezoid is generally defined as a quadrilateral with two parallel sides. Thus English writers have retained trapezium in the broader sense, and have used trapezoid in the restricted sense of a Euclidean trapezium with two sides parallel. The continental custom is historically and etymologically the better. There is, however, hardly a necessity for both words, since the word quadrilateral is now invariably used by modern geometers for a four-sided figure which is not a parallelogram.

**Trapezoid Bone,** in anatomy, a bone of the wrist of which the superior surface articulates with the scaphoid bone, the external with the trapezium, the internal with the os magnum, and the inferior with the second metacarpal bone. It is smaller than the trapezium, has its largest diameter from before backward, and its posterior surface, which is much larger than the anterior one, pentagonal.

**Trapezus.** See TREBIZOND.

**Traphagen, Frank Weiss,** an American chemist; born in Eaton, O., July 20, 1861; was graduated at the School of Mines, Columbia University, in 1882. He then pursued special studies in analytical and applied chemistry. He was Professor of Chemistry in the College of Montana in 1887–1893. In the latter year he accepted the chair of chemistry at the Montana State College and became chemist of the Montana Agricultural Experiment Station. He was the author of bulletins on "Drinking Water"; "The Alkali Soils of Montana"; "The Sugar Beet in Montana"; etc.; and of "A New Departure in Cyanide Treatment" (1899); "Some Notes on the Estimation of Carbohydrates" (1899); "Notes on Alkali Soil in Montana" (1899); "Food Adulteration in Montana"; "Labor and Industry" (1900); etc.

**Trappists,** a religious order, celebrated for its extraordinary austerities, is so called from an abbey of the Cistercian order, founded in the middle of the 12th century, in the narrow valley of La Trappe, near Mortagne, in the Norman department of Orne — called "the trap" because of its inaccessibility. The discipline of this monastery, in common with many others of the more wealthy monastic bodies, especially of those which were held *in commendam,* had become very much relaxed. In the first half of the 17th century the abbey of La Trappe fell, with other ecclesiastical preferments, to Dominique Armand-Jean le Bouthillier de Rancé (1626–1700), originally an accomplished but worldly courtier, who suddenly underwent a great change and turned his back on the vanities of the world. He undertook a reform of his monastery, and in the end established what was equivalent to a new religious order. It was in 1662 that he commenced his reforms. At first he encountered violent opposition from the brethren; but his firmness overcame it all. He himself entered on a fresh novitiate in 1663, made anew the solemn profession, and was reinstalled as abbot. From this time may be dated the introduction of the new austerities which characterized the order. The monks were forbidden the use of meat, fish, wine, and eggs. All intercourse with externs was cut off, and the old monastic habit of manual labor was revived.

The reform of De Rancé is founded on the principle of perpetual prayer and entire

self-abnegation. By the Trappist rule the monks are obliged to rise at two o'clock A. M. for matins in the church, which last till half-past three; and after an interval occupied in private devotion they go at half-past five to the office of prime, which is followed by a lecture. At seven they engage in their several daily tasks, indoors or out, according to the weather. At half-past nine they return to the choir for the successive offices of terce, sext, and none; at the close of which they dine on vegetables dressed without butter or oil, or on vegetable soup, and a little fruit. Milk and cheese are used save in time of fast; the sick are allowed eggs. The dietary is not the same in all the houses of the order. In some light beer or wine is sparingly allowed. The principal meal is succeeded by manual labor for two hours, after which each monk occupies an hour in private prayer or reading in his own cell till four o'clock, when they again assemble in the choir for vespers. The supper consists of bread and water, and after a short interval of repose is followed by a lecture. At six o'clock they recite compline in choir, and at the end spend half an hour in meditation, retiring to rest at eight o'clock. The bed is a hard straw mattress, with a coarse coverlet; and the Trappist never lays aside his habit, even in case of sickness, unless it should prove extreme. Perpetual silence is prescribed, save in cases of necessity, and at certain stated times; only the abbot and the guest-master are allowed to speak to strangers. But conversation by means of manual and other signs are practised. The minor practices and observances are devised so as to remind the monk at every turn of the shortness of life and the rigor of judgment; and the last scene of life is made signal in its austerity by the dying man being laid during his death-agony on a few handfuls of straw, that he may, as it were, lay aside on the very brink of the grave even the last fragment of earthly comfort to which the necessities of nature had till then compelled him to cling.

The reformed order of La Trappe scarcely extended beyond France in the first period of its institution. The inmates of La Trappe shared, at the Revolution, the common fate of all the religious houses of France; they were compelled to quit their monastery; but a considerable number of them found a shelter at Valsainte, in the canton of Fribourg, in Switzerland. In the vicissitudes of the Revolutionary War they were driven from this house; and a community numbering about 250, together with a large number of nuns who had been established for purposes of education, found refuge at Constance at Augsburg, at Munich, and even in Russia. Later in the course of the war small communities obtained a certain footing in Italy, Spain, America, England, and, notwithstanding the prohibitory law, even in France, at Mont Genèvre. After the Restoration they resumed, by purchase (1817), possessions of their old home at La Trappe, which continued to be the head monastery of the order. During the course of the next 50 years they formed many establishments in France, the house of La Meilleraye being one of the famous abbeys. When in 1880 1,450 brethren of the order were expelled from France only a comparatively small number were left. In England the Cistercian house of St. Bernard, in Leicestershire, is Trappist; so is the convent at Stapehill, in Dorset. In Ireland the order has houses at Mount Melleray, near Cappoquin, in Waterford, and at Roscrea, in Tipperary. America has houses at Gethsemane, in Kentucky, at New Melleray, near Dubuque, Ia., at Tracadie, in Nova Scotia, and at Oka, on the Ottawa river, 36 miles from Montreal; there are houses in Germany, Algiers, Italy, and Belgium; there is even one (of German brethren) in Turkey.

**Trasimene Lake,** a shallow Italian lake lying between the towns of Cortona and Perugia. Surrounded on all sides by hills, it is about 10 miles in length by 8 in breadth. There is no outlet, and the margins are flat and overgrown with reeds, but of late largely planted with eucalyptus trees. The lake is memorable for the great victory obtained there by Hannibal in 217 B. C. over the Romans, when 15,000 Romans were slain, and 10,000 captured, Hannibal losing only 1,500 men.

**Trasimeno, Lago.** See PERUGIA, LAGO DI.

**Trask, William Blake,** an American author; born in Dorchester, Mass., Nov. 25, 1812; received a common school education and learned the trade of cabinet making. Later he devoted himself to historical and antiquarian researches. He was the author of "Memoir of Andrew H. Ward" (1863), and the editor of "The Journal of Joseph Ware" (1852); "Baylie's Remarks on General Cobb" (1864); "The Bird Family" (1871); and "The Seaver Family" (1872). He also aided in the compilation of "History of Dorchester." Died in 1906.

**Trass,** a volcanic production, consisting of ashes and scoriæ thrown out from the ancient Eifel volcanoes, on the Rhine, near Coblentz. It is equivalent, or nearly so, to the puzzolana of the Neapolitans, and is used as a cement. The same name is given to a coarse sort of plaster or mortar made from several other argillo-ferruginous minerals, used to line cisterns and other reservoirs of water.

**Traun, Lake of,** a small but beautiful lake in Upper Austria, near the town of

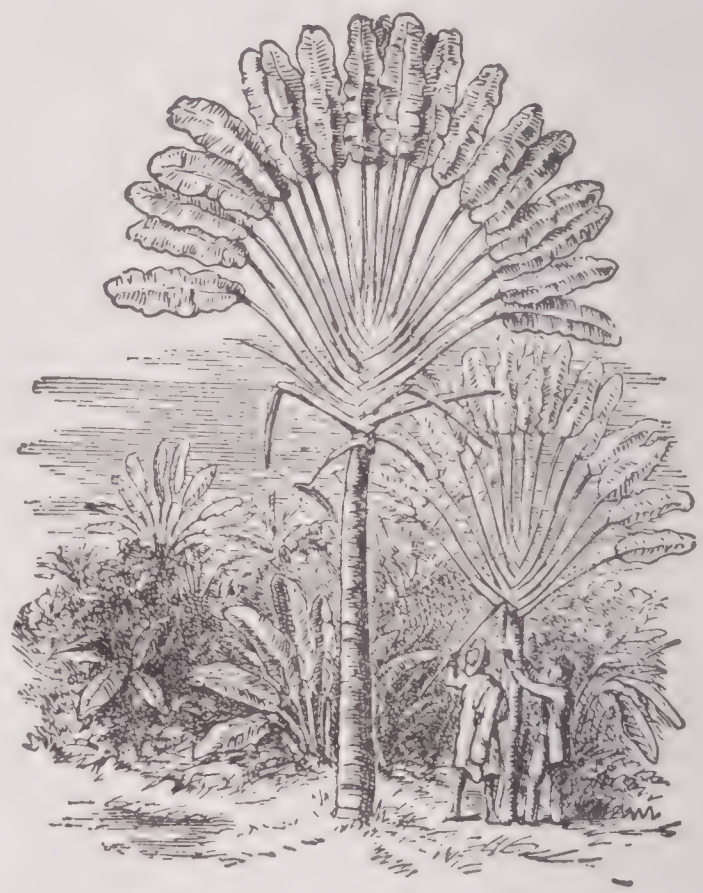
Gmunden. The river Traun passes through the lake and enters the Danube.

**Trautwinite,** a microcrystalline mineral, occurring in crystals, the system of which has not yet been determined; hardness, 1–2; color, green; luster, dull; streak, light-gray. Analysis yielded: Silica, 21.78; sesquioxide of chromium, 38.39; sesquioxide of iron, 13.29; alumina, 0.81; lime, 18.58; magnesia, 7.88; loss on ignition, 0.11 = 100.84. Occurs on chromite in Monterey co., Cal.

**Travancore,** native Tiruvánkod, a protected State in the extreme S. of British India; bounded on the N. by Cochin, on the E. by British territory and on the W. by the Indian Ocean. The State pays a yearly tribute of $40,000 to Great Britain, and is politically connected with the province of Madras; area, 6,730 square miles; pop. (1901) 2,952,157, mainly Hindus, belonging to 420 castes, from Brahmans to Negroid hillmen. Nairs are over a fourth of the total, Mohammedans only 7 per cent. There are many native Christians of the Syrian rite and some black Jews. At the S. extremity of the State is Cape Comorin; the Western Ghats run along the E. side. W. of the hill foots is a level belt, 10 miles wide, covered with cocoanut and areca palms. On the elevations the soil is light and gravelly; in the valleys it is in general a deep black mould. Travancore shares with Cochin the lagoons or backwaters along the coast. The chief produce is copra, coir, tobacco, nut oil, areca nut, ginger, pepper, cardamoms, beeswax, coffee, and timber. The rajahs are intelligent, have been faithful to the English alliance, cherish education, and govern well. The capital is Trivandrum; other principal places are Aulapolai and Quilon.

**Traveler's Joy,** in botany, the genus *Clematis;* specifically: (1) *C. vitalba.* Gerard seems to have invented the popular name to indicate the adornment of the hedges by means of these flowers, and the pleasure thus afforded to travelers. (2) *C. viorna,* a North American species, climbing, with pinnately-compound leaves and a large, solitary campanulate, nodding flower of purple or violet color. It was introduced into Europe as a garden plant in 1730.

**Traveler's Tree,** the monotypic genus *Ravenala* of the natural order *Muscaceæ* — differing from *Musa* in habit, by having a tall, simple, woody trunk and distichous leaves. It bears the name of *R. Madagascariensis,* or is sometimes still called by its older title of *Uranea speciosa.* This noble and unique plant is a native of Madagascar, and is now subspontaneous in Mauritius. The leaves surmounting the palm-like trunk diverge on opposite sides from the summit, "somewhat in the same way as the ribs of a fan from its center," each consisting of a footstalk six to eight feet long, and an oblong, bright-green, shining, undivided blade of four to six feet. The flowers are crowded in the axils of large spathes along the terminal flower-stalks, and the seeds surrounded by a pulpy blue arillus are in a woody three-celled capsule. In the cup-like base of the leaf-stalks a considerable quantity of water is contained, which can be tapped by piercing from below; and this supply, being availed of by thirsty travelers,



THE TRAVELERS' TREE.

has originated the name of travelers' tree. The leaf blades are used for thatching, the seeds are edible, and the blue aril furnishes an essential oil.

**Traveling Sidewalks,** movable platforms to carry passengers from one point to another. They were first practically tested at the World's Columbian Exposition in Chicago in 1893, and since then successfully installed in Berlin. The sidewalk built for the Paris Exposition of 1900 was over three miles long. This sidewalk consisted of three parallel platforms, the outer one being stationary, the next having a speed of 4 kilometers, and the inner one a speed of 8 kilometers, per hour. With these speeds it was found to be very easy to step from one to the other at any point, so that there were no delays from stoppage, this fact together with the enormous carrying capacity, rendered the moderate speed ample for prompt conveyance to any part of the line. A modification of this plan is the traveling stairway, installed with great success in some of the elevated stations, and large department stores in New York city, Chicago and other cities.

**Traverse Board,** nautically, a circular board marked with the compass points, and having holes and pegs to indicate the course by which the ship has been sailing. It is used for recording the courses run during a watch.

**Traverse Circle,** in fortifications, a circular track on which the chassis traverse wheels of a barbette carriage, mounted with a center or rear pintle, run while the gun is being pointed; the arrangement enabling it to be directed to any point of the horizon. In permanent fortifications it is of iron, and is let into the stonework; in field works it is frequently made up of pieces of timber mitered together and imbedded in the earth. Nautically, a metallic circle let into the upper deck of a war vessel for the wheels of a pivot-gun carriage to traverse on.

**Traverse Drill,** a drill for boring slots. Either the drill or the work has a lateral motion after the depth is attained. Also a drill in which the stock has a traverse motion for adjustment.

**Traverse Sailing,** in navigation, the case in plane sailing where a ship makes several courses in succession, the track being zigzag, and the directions of it several times traversing or lying more or less athwart each other. For all these actual courses and distances a single equivalent imaginary course and distance may be found, which the ship would have described had she sailed direct for the place of destination; finding this single course is called working or resolving a traverse, and is effected by trigonometrical computation or by the aid of the traverse table.

**Traverse Table,** in navigation, a table by means of which the difference of latitude and departure corresponding to any given course and distance may be found by inspection. It contains the lengths of the two sides of a right-angled triangle, usually for every quarter of a degree of angle, and for all lengths of the hypotenuse from 1 to 100. In railroading a platform on which cars are shunted from one track to another of a switch table.

**Traversellite,** in mineralogy: (1) A variety of pyroxene, containing little or no alumina, occurring in long, transparent crystals, with marked longitudinal striæ, frequently green and colorless at opposite ends. (2) A leek-green pyroxene, opaque, with a fibrous structure, frequently terminating in asbestiform threads.

**Travesty,** a literary term used to denote a burlesque treatment of a subject which has been originally handled in a lofty or serious style. It differs from a parody in that in travesty the character and the subject matter remain substantially the same, while the language becomes grotesque, frivolous, and absurd, whereas in a parody the subject matter and characters are changed and the language and style of the original humorously imitated.

**Travis, William Barrett,** an American military officer; born in Conecuh co., Ala., in 1811; was admitted to the bar and practised in Claiborne, Ala. In 1832 he removed to Texas, took up arms against Mexico; and commanded the small garrison at the Alamo (see ALAMO, FORT) when that place after a famous defense of 10 days was carried by 4,000 Mexicans, in March, 1836. Travis with five others, the only survivors at the capture of the fort, was put to death on March 6, by order of the Mexican commander, Santa Ana.

**Trawling,** a mode of fishing in which a net in the form of a large bag, with a strong framework keeping the mouth properly distended, is dragged along the bottom of the sea. It is the mode chiefly adopted in deep-sea fishing, and has largely developed in recent years, being much prosecuted by small steam vessels specially built for the purpose, but it is not ordinarily allowed within three miles of the shore. Cod, whiting, and other whitefish are taken by it in large numbers, and some kinds of flat fish, as soles, can scarcely be taken in any other way. Trawling can be practised only on a smooth bottom, as a rough bottom would destroy the net. In Scotland the term trawling is often improperly applied to fishing for herring with the seine.

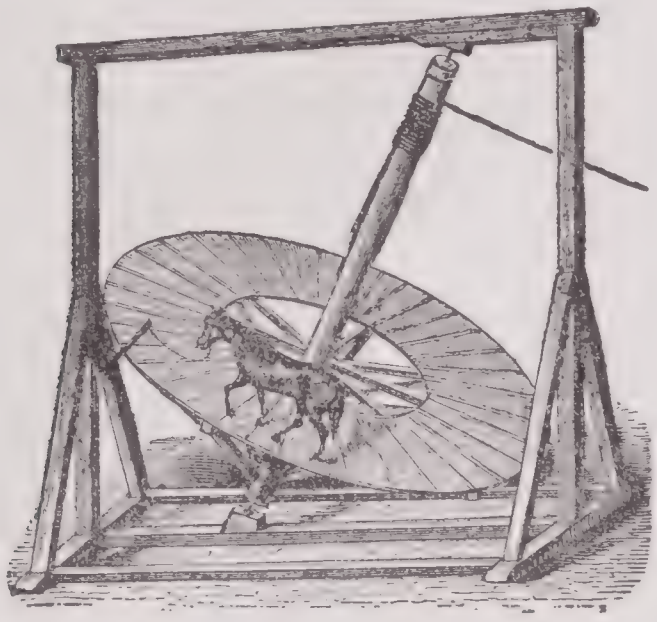
**Treacle,** the dark, viscous, uncrystallizable syrup obtained in refining sugar; also the drainings of crude sugar, properly distinguished from treacle as molasses.

**Treacle Mustard,** in botany: (1) *Clypeola,* a cruciferous genus. (2) *Erysimum cheiranthoides,* a British crucifer, one or two feet high, with lanceolate leaves, yellow flowers, and short, nearly erect pods. It is found chiefly in the S. of England, and is considered by Watson to be colonist. So named because it was formerly used as an ingredient in Venice treacle, a vermifuge once much in vogue.

**Treadmill,** a wheel driven by the weight of persons treading on the steps of the periphery; originally an invention of the Chinese to raise water for the irrigation of fields. It is employed in some prisons, where it forms part of the "hard labor" of persons convicted. The usual form is a wheel 16 feet long and five in diameter, several such wheels being coupled together when necessary for the accommodation of the prisoners. The circumference of each has 24 equi-distant steps. Each prisoner works in a separate compartment, and has the benefit of a hand rail. The wheel makes two revolutions per minute, which is equivalent to a vertical ascent of 32 feet. The power may be utilized in grinding grain or

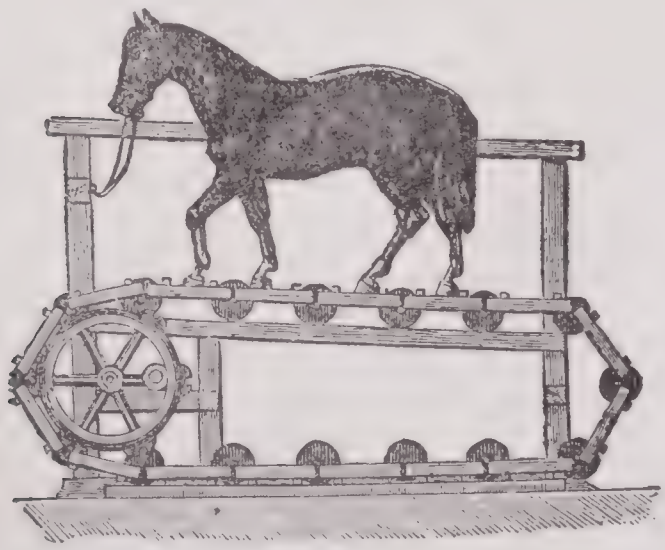
turning machinery. The treadmill is a feature of English prison discipline, and sometimes is not revolved to any useful effect, a brake being simply attached to the axle, forming a seat for the warder, who regulates the work or speed by moving toward or from the outer end of the lever. Its use, as part of the machinery of "hard labor" in prisons, is now greatly restricted, as the weak and strong are by it compelled to equal exertion.

**Treadwheel,** a wheel turned by men or animals, either by climbing or pushing with the feet. In one form employed for raising



A TREADWHEEL.

water a rope is wound directly around the axle, and has a bucket at each end; these are alternately raised and lowered by reversing the movement of the wheel. A form of treadwheel in which a donkey walks inside of a large wheel is used in pumping from the deep well of Carisbrook Castle, En-



A TREADWHEEL.

gland; turn-spit dogs were formerly used in turning the spit upon which meat was roasted; and dogs are employed in some dairies to turn the barrel churns or agitate the vertical dashers of plunger churns. Like the modern treadmill the treadwheel was formerly used as a means of punishment and prison discipline.

**Treason, High,** that crime which is directly committed against the supreme authority of the State, considered to be the greatest crime that can be committed. Formerly in England certain offenses against private superiors were ranked as petit or petty treason, and it was in opposition to such offenses that treason against the sovereign was called high treason; but by an act of Geo. IV. high treason was made the only treason. In a monarchy it is considered to be the betraying or the forfeiting of allegiance to the monarch; but in a republic it has reference to the government or the whole community. The present law of treason in England rests substantially on the statute of the 25th year of Edward III., which comprehends the following descriptions, namely: (1) Compassing or imagining the king's death. (2) Violation of the king's companion (meaning the queen), his eldest daughter, unmarried, or the wife of the eldest son and heir. (3) Levying war against the king in his realm. (4) Adhering to his enemies in his realm, and giving them aid and comfort in the realm or elsewhere. (5) Counterfeiting the great or privy seal. (6) Slaying the chancellor, treasurer, etc. The third of the offenses detailed in this statute is now treason felony, and has a milder punishment than treason annexed to it. Clause 5 is now repealed. The English law condemns the person convicted of treason to be drawn in a hurdle to the place of execution, there to be hanged, and then beheaded and quartered; and a conviction was followed by forfeiture of land and goods and attainder of blood; but this is now restricted to hanging, forfeiture and attainder being abolished. The concealment of treason is called misprision of treason.

In the United States treason consists in levying war by a citizen against the country, or adhering to its enemies. In the session of Congress (1901–1902), several measures were introduced making any attack on the life of the President, Vice-President, or certain other government officials an act of treason, and punishable by death. The provision was also introduced that the offender should be tried by the Federal Courts, thus removing such cases from the jurisdiction of State courts at the place of the occurrence.

**Treason Felony,** in England, a term commonly used to designate those offenses which are pronounced felony, namely, the compassing, imagining, inventing, devising, or intending, first, to deprive the sovereign of any of the royal powers or prerogatives; or, second, to levy war within the realm in order to forcibly compel him to change his measures, or to intimidate either house

of Parliament, or to excite an invasion in any of his majesty's dominions. Treason felony is punishable with penal servitude for life or for a term not less than seven years, or with imprisonment for a term not exceeding two years with or without hard labor.

**Treasure-trove,** in English law, any money or coin, gold, silver, plate, or bullion, found hidden in the earth or other private place, the owner thereof being unknown. In such cases the treasure-trove belongs to the crown. If the owner is known, or is ascertained after the treasure is found, the owner and not the crown, is entitled to it. It is the practice of the crown to give to the finder the full value of the treasure found on its being given up. Concealing or appropriating treasure-trove is an indictable offense, punishable by fine and imprisonment. If it be found in the sea, or on the earth, it does not belong to the crown, but to the finder, if no owner appears.

**Treasury,** a place or building in which treasure is deposited; a store-place for wealth; particularly, a place where the public revenues are deposited and kept, and where money is disbursed to defray the expenses of government; also, a place where the funds of an incorporated company or private society are deposited and disbursed. In particular, a department of government having control over the management, collection, and expenditure of the public revenue.

**Treasury Department,** one of the executive branches of the United States government; the fiscal branch of the government. It primarily controls the collection, custody, and disbursement of the public revenue, and prior to 1903, when the Department of Commerce and Labor was created, it had several bureaus that are now in the new department. (See COMMERCE AND LABOR, DEPARTMENT OF). It is presided over by a secretary, who directs the collection, safekeeping, and disbursement of the revenue, submits to Congress the estimates of annual expenditures, and of the probable revenue; prepares plans for the improvement and management of the revenue, and for the support of public credit; prescribes the forms of keeping and rendering all public accounts; collects and registers statistics of commercial and manufacturing operations, and in general directs the business of the department, in all of which he has the aid and advice of three assistant secretaries and the assistance of a corps of bureau officers who attend to matters of administrative detail in their respective services. Payments are made on warrants issued by the secretary or an assistant secretary, countersigned by either the first or second comptroller, and registered by the register of the treasury. The office of the Treasurer of the United States is a bureau of the Treasury Department, and is specially charged with the custody of the public money. Other important branches of the Treasury Department are the Bureau of Engraving and Printing, Bureau of the Mint, Office of the Comptroller of the Currency, and the Secret Service Division engaged in the detection and prevention of counterfeiting.

In Great Britain the duties of this department are entrusted to a board of commissioners entitled Lords of the Treasury. The commissioners are five in number. The First Lord of the Treasury is, as a rule, the prime minister, or head of the government. He must be a member of one of the Houses of Parliament. As prime minister he has an extensive patronage, civil, legal, and ecclesiastical, appoints the chief officers of state, and regulates the various departments under the crown. The office is frequently combined with another in the ministry: thus, the First Lord at times holds the office of Secretary of State for Foreign Affairs. The virtual head of the Treasury is the Chancellor of the Exchequer, with which office that of First Lord is sometimes united. He must be a member of the House of Commons, and exercises complete control over the expenditure of the different branches of the service. He prepares the annual estimate of the state expenses, and of the ways and means by which it is proposed to meet them, and lays this statement, commonly called the budget, before the House of Commons.

**Treat, Mary Lea Adelia (Davis) (Allen),** an American naturalist; born in Tompkins co., N. Y., in September, 1830. She wrote: "Chapters on Ants"; "Home Studies in Nature"; "Injurious Insects of the Farm and Garden"; "My Garden Pets"; "Through a Microscope"; etc.

**Treaty,** specifically, an agreement, contract, or league between two or more nations or sovereigns, formally signed by commissioners, duly accredited, and solemnly ratified by the several sovereigns or supreme authorities of each state. Treaties include all the various transactions into which States enter between themselves, such as treaties of peace, or of alliance, offensive or defensive, truces, conventions, etc. Treaties may be entered into for political or commercial purposes, in which latter form they are usually temporary. The power of entering into and ratifying treaties is vested in monarchies in the sovereign; in republics it is vested in the chief magistrate, senate, or executive council; in the United States it is vested in the President, by and with the consent of the Senate. Treaties may be entered into and signed by the duly authorized diplomatic agents of different States, but such treaties are subject to the approval

and ratification of the supreme authorities. See PEACE TREATIES.

**Treaty of Abo.** See ABO, PEACE OF.

**Treaty of Bartenstein.** See BARTENSTEIN, TREATY OF.

**Treaty of Basel.** See BASEL, TREATY OF.

**Treaty of Bayonne.** See BAYONNE, TREATY OF.

**Trebelli, Zelia,** a French opera singer; born in Paris, France, in 1838; made her début at Madrid under the name of Trebelli in 1859. The next year she entered on a series of triumphs at Berlin, and in 1862 passed to London, where her success was also immediate. In the years that followed, marked by tours in Scandinavia, Russia, and the United States (1884), she held the position which she had at once assumed of the greatest mezzo-soprano of her day. She died in Etretat, France, Aug. 18, 1892.

**Trebizond,** the principal Turkish port on the Black Sea; on the N. E. coast of Asia Minor, and the second commercial city of the empire; 110 miles N. W. of Erzerum. It is finely situated on the steep slope of the Kolat Dagh (800 feet high) facing the sea, and is partly surrounded by walls, and further defended by a Genoese citadel on an adjoining hill, and by forts at the mouth of the harbor. The gorge-like course of a mountain stream traverses Trebizond, and is crossed by several bridges. The coast is high and crested with pine woods, and from the sea the irregularly-built town, with its minarets and gardens, has a striking appearance. There are 18 mosques, 15 Christian churches, and many elegant baths and spacious bazaars. The industries, chiefly weaving and dyeing, are unimportant; but the products of the surrounding country, which form part of the exports of Trebizond, comprise considerable quantities of boxwood, loupes or walnut-tree knobs, valued in France for veneers, beans, wheat and Indian corn, fruits and provisions, nuts and walnuts, skins, wool, tiftick and fillick, and tobacco. Trebizond is an emporium for the Persian trade, but has suffered greatly from the opening of the railway from Tiflis to Poti, and the diversion of trade to Batoum. It is a terminus for caravans from Erzerum, Armenia, Kurdistan, Tabriz, etc., and has regular communication by steam line with Constantinople, the Danube, and French ports. The harbor is only an open roadstead, and during the autumn equinoxes vessels have to shelter either at Batoum or at Platina, 6 miles W. Besides the opening of the Poti railway, the want of good roads in the interior, the neglect of the larger crown forests, and the imposition of heavy custom dues, have checked Trebizond's prosperity. Trebizond, founded by a colony from Sinope, 756 B. C., was a great trading town in Xenophon's time, and continued to flourish as an emporium for the Indian trade under the Roman empire. Its period of greatest prosperity as capital of the Comnenian empire of Trebizond began in 1204 and lasted till 1461, when David, last of the Comnenes, was captured by Mohammed II. Since then Trebizond has belonged to the Porte. Pop. about 45,000.

**Treble,** in music, of or pertaining to the highest vocal or instrumental part, sung by boys, or played by violins, oboes, clarinets, or other instruments of acute tone.

**Treble Bar,** in entomology, a European geometer moth, *Anaitis plagiata.* Fore wings pale gray, with three transverse black bars; hind wings smoky gray with a double transverse line, the inner part darker, the outer lighter than the rest of the wing. The caterpiller feeds on the flowers and leaves of *Hypericum perforatum.*

**Treble Brownspot,** in entomology, a European geometer moth, *Acidalia trigeminata.* Wings very pale wainscot brown, almost yellow, with a dark gray band interrupted in the middle.

**Treble Lines,** in entomology, a European night moth, *Grammesia trilinea.* Wing expanse an inch and a half; fore wings dingy gray, with four slender transverse darker lines; hind wings of deeper hue. The caterpiller feeds on *Plantago major.*

**Tree,** in botany, any woody plant rising from the ground, with a trunk, and perennial in duration; an arborescent plant as distinguished from a shrub, an under-shrub, and an herb. The classification of plants which at first suggests itself as the most natural one is into trees, shrubs, and herbs. This is still the popular classification as it was that of the oldest observers (I Kings iv: 33); but it violates all natural affinities, and has long since been abandoned by botanists. Trees occur in many orders, their stems varying in structure according to the sub-kingdoms to which they belong. They may be exogenous, or of that modification of the exogenous stem which exists in gymnogens, or may be endogenous or acrogenous. The age of certain trees, especially of exogens, is often great, and, when cut down, the number of years they have existed can be ascertained by counting the annual zones. Some of the giant cedars of California are more than 100 feet in circumference, 400 feet high, and certainly 3,000 years old. Von Martius describes the trunks of certain locust trees in Brazil as being 84 feet in circumference and 60 feet where the boles become cylindrical. From counting the annual rings of one, he formed the opinion that it was of about the age of Homer; another estimate increased the age to 4,104 years, but a third one made

the tree first grow up 2,052 years from the publication of Martius' book (1820). A baobab tree (*Adansonia digitata*) in Senegal was computed by Adanson, A. D. 1794, to be 5,150 years old; but he made his calculations from the measurement of only a fragment of the cross section, and, as zones differ much in breadth, this method of computation involves considerable risk of error. Sir Joseph Hooker rejects the conclusion. Most trees are deciduous, *i. e.*, have deciduous leaves, a few are evergreen. To the latter kind belong those coniferous trees which form so conspicuous a feature in the higher temperate latitudes, while deciduous trees prevail in lower latitudes. The planting of trees is now more attended to than formerly, especially in cities and on the prairie lands of the United States. See FORESTRY.

**Tree Crab,** a crab of the genus *Birgus*, included among the land crabs. It breaks open the shell of the cocoanut, etc., by repeated blows of its great claws, in order to feed on the soft pulp of the nut. Tree crabs can live for long periods out of water, but deposit their eggs in the sea.

**Tree Climber,** in ichthyology, the *Anabas scandens*, the climbing perch. Lieutenant Dindorf, of the Danish East India Company's Service, told Sir Joseph Banks that he had taken this fish from a moist cavity in the stem of a Palmyra palm growing near a lake. He saw it when already four feet above the ground struggling to ascend still higher — suspending itself by its gill-covers, and bending its tail to the left, it fixed its anal fin in the cavity of the bark, and sought, by extending its body to urge its way upward, and its march was only arrested when seized. Tennent says:

> "The motive for climbing is not apparent, since water being close at hand it could not have gone for the sake of the moisture contained in the fissures of the palm, nor could it be in search of food, as it lives not on fruit but on aquatic insects. The descent, too, is a question of difficulty. The position of its fins and the spines on the gill-covers might assist its journey upward, but the same apparatus would prove anything but a facility in steadying its journey downward. The probability is that the ascent which was witnessed by Dindorf was merely accidental, and ought not to be regarded as the habit of the animal."

**Tree Creeper,** in ornithology, the *Certhia familiaris*, a slender bird, scarcely so large as a sparrow, with a long, curved sharp-pointed bill, and stiff tail feathers; plumage on upper surface shades of brown, wings barred with pale brown and black, and nearly all wing-feathers tipped with white; under surface silvery white, flanks and vent with a rufous tinge. Found generally in temperate climates where old wood prevails. It is an excellent climber, running rapidly by jerks in a spiral direction over the bark of trees, searching for small insects which lurk in the crevices, picking them out with its slender bill, occasionally varying its diet on the seeds of various conifers.

**Tree Digger,** a kind of double plow employed in nurseries for cutting off the roots of trees which have been planted in rows. It divides the earth at a certain depth below the surface, and at a determinate distance on each side of the rows, to permit the tree to be readily removed from the soil.

**Tree Fern,** in botany, a fern rising to the elevation, and, to a certain extent, having the structure of a tree. The trunk is really a rhizome, consisting of a woody cylinder, of equal diameter at each end, growing only at the top, and composed internally of loose, cellular substance, which often disappears. When actual wood is present, it consists almost wholly of large scalariform or dotted ducts imbedded in hard plates of thick-sided, elongated tissue, usually of an interrupted sinuous aspect, though sometimes constituting a complete tube. Externally the stem has a hard, cellular, fibrous rind, consisting of the united bases of leaves, and is thicker below than above. Many tree ferns belong to the genus *Cyathea*. Tree ferns flourish further from the equator in the Southern than in the Northern Hemisphere. They do so in New Zealand.

**Tree Frog,** in zoölogy, any individual of the family *Hylidæ*. They are of small size, more elegant in form than the true frogs, of brighter colors, and more active habits. They feed on insects, which they pursue on the branches of shrubs and trees. The European tree frog (*Hyla arborea*) is common in the middle and S. of the Continent, and ranges into Asia and the N. of Africa. It becomes very noisy on the approach of rain, and is often kept in confinement as a kind of barometer. The common tree frog of North America is *Hyla versicolor*, replaced in the S. by the green tree frog, *H. viridis*.

**Tree Germander,** in botany, the *Teucrium scorodonia;* a labiate plant, one or two feet high, with downy and much wrinkled leaves, crenate on the margin, and yellowish-white flowers. It is frequent in woods and dry, stony places, flowering in August and September. It is very bitter, and has sometimes been substituted for hops.

**Tree Hair,** in botany, the *Cornicularia jubata*, a lichen hanging in dark, wiry masses from trees in subalpine woods.

**Tree Lichen Beauty,** in entomology, a night moth, *Bryophila algæ*. Fore wings gray-green at the base followed by a transverse whitish bar, then by a brown band, and then again by a pale bar and a greenish fringe; hind wings brown with a discoidal spot.

**Tree Mouse,** in zoölogy, a popular name for any of the *Dendromyinæ,* an African sub-family of *Muridæ.* The ears are clothed with hairs; and the feet, which are five-toed, are fitted for climbing.

**Tree Pigeon,** in ornithology, a popular name for any pigeon of the genus *Treron.* The species are shy and timid and inhabit the woods of intertropical Asia and Africa. The prevailing colors of the plumage are green and yellow of different shades, more or less contrasted with rich purple and reddish brown. Their note is very different from the mere cooing of the ringdove.

**Tree Porcupine,** in zoölogy, a popular name for any species of *Synetherina.* They are of considerable size, measuring from 16 to 20 inches without the tail, which is about a third the length of the head and body. They are of lighter build than the ground porcupines, are covered with short, close, many-colored spines, often mixed with hairs, and their tail is always prehensile. They are nocturnal in their habits, and live on fruit and roots.

**Tree Purslane,** in botany, the *Portulacaria afra,* an evergreen African shrub, about three feet high; with purple flowers in its native country, but which has not flowered in greenhouses since A. D. 1732.

**Tree Rat,** in zoölogy, the *Mus arboreus,* about seven or eight inches long, from Bengal. It builds a nest in cocoanut trees, and bamboos, and lives partly on grain and partly on young cocoanuts.

**Tree Runners,** in ornithology, Swainson's name for *Anabatinæ,* which he makes a sub-family of *Certhiadæ.* Its type genus is *Anabates,* founded on *A. subcristata,* a Brazilian bird.

**Tree Sorrel,** in botany, *Rumex lunaria,* an evergreen plant, about two feet high, with greenish flowers, introduced from the Canaries into European greenhouses in A. D. 1690. It is cultivated in the United States.

**Tree Soul,** an animating and individuating principle supposed by races practising tree worship to reside in every tree.

**Tree Sowthistle,** in botany, *Sonchus arvensis.* Root with creeping scions, stem simple, leaves denticulate, clasping the stem, with short, obtuse auricles; involucre glandulose, hispid; flowers very large, yellow. Frequent in cornfields. Called also corn sowthistle.

**Tree Squirrel,** in zoölogy, any individual of the genus *Sciurus,* as distinguished from the flying squirrels (*Pteromys*) and the ground squirrels (*Tamias*).

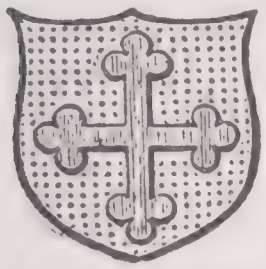
**Tree Toad,** in zoölogy, a popular name for several of the *Hylidæ.* Used without a qualifying epithet, it is equivalent to tree frog. With a qualifying epithet it is limited to particular species. *Hyla versicolor* is the changeable tree toad, *Trachycephalus lichenatus,* is the lichened, and *T. marmoratus* the marbled tree toad.

**Tree Worship,** in comparative religion, a form of religion which has been general to most of the great races of mankind at a certain stage of mental development. It may have been a particular kind of nature worship, or have arisen from the animistic conception prevailing among the races of low culture at the present day, that trees were the residences or embodiments of spirits or deities. Tree worship was a peculiar Canaanitish cult, as is proved by the frequent mention of it in the Old Testament, and the stern denunciations of it show that the Jews, from time to time, lapsed into the nature worship of their neighbors (Deut. xii: 3, xiv: 21; Judges vi: 25; I Kings xvi: 23; xv: 13, xviii: 19; II Kings xvii: 10, xxiii; Isa lvii; 5: Jer. xvii: 2; Ezek. vi: 13; xx: 28; Hos. iv: 13). It formed an essential part of the classic mythologies, in which are found superhuman beings attached to individual trees, and sylvan deities — dryads, fauns, and satyrs — roaming in the forest, the analogues of which still live in folk tales as elves and fairies. Tree worship, in some form or other in Southern Asia, still composes an important part of Buddhist practice, though it is not recognized by Buddhistic sacred literature. The famous Bo tree, grown from a branch of the tree sent by Asoka to Ceylon in the 3d century B. C., till its destruction in October, 1887, received the worship of pilgrims, who came in thousands to do it reverence and offer prayer before it.

Fergusson also shows what a large place tree worship held in early Buddhism, and that it was then closely connected with serpent worship. On this subject Tylor remarks: "The new philosophic religion seems to have amalgamated, as new religions ever do, with older native thoughts and rites. Down to the later Middle Ages tree worship lingered in Central Europe; while names like 'Holyoake' and 'Holywood' record the fact that at no very remote period holy trees and groves existed in Britain; and it is a remarkable fact that a sacred linden tree in the parish of Hvityard, in South Sweden, gave a name to the family of Linnæus. At the present day tree worship is prevalent among native races in Africa, Asia, and Australia. In Europe, though traces of it still linger in folk tales and popular customs, it no longer exists as a cult, except among the people of the Chersonese, who, though nominally Greek Christians, "still adhere to their beliefs in good and evil spirits, and worship them — the good spirits in forests and groves where coniferous are mixed

with foliaceous trees, and the evil spirits in purely coniferous forests. Every god is represented by a special tree, the worship of which is provided for by a separate priest chosen by lot."

**Treflee,** in heraldry, an epithet applied to a cross, the arms of which end in triple leaves, representing trefoils. Bends are sometimes borne treflee, that is, with trefoils issuing from the side.



CROSS TREFLEE.

**Trefoil,** or **Treyfoil,** in botany (1) The genus *Trifolium*, specifically, *T. Minus.* (2) *Medicago lupulina.* (3) *Stylosanthes procumbens*, a West Indian species of *Hedysareæ*, with yellow dimorphic flowers (see CLOVER). In architecture, an ornament used in Gothic architecture, formed by moldings in the heads of window lights, tracery, panelings, etc., so arranged as to resemble the trefoil or three-leaved clover. In heraldry, a charge representing the clover leaf, and always depicted as slipped, that is, furnished with a stalk.

**Tregelles, Samuel Prideaux,** an English theological critic; born in Falmouth, England, Jan. 30, 1813. He was educated at Falmouth grammar school, and spent some years as a private teacher, but from an early age gave himself to the study of the New Testament text, and at 25 formed the plan of a Greek New Testament on the principles which he afterward carried out. In preparing for his great work he visited the Continent three times in search of MSS., and spent five months in Rome, where he was allowed to see, but not to collate, the "Codex Vaticanus." The first part appeared in 1857; the sixth, completing the text, in 1872. The seventh part, containing the *prolegomena*, appeared in 1879, edited by Dr. Hort and A. W. Streane. Other of his works were the "Codex Zacynthius" (1861), and "Canon Muratorianus" (1868); an "Account of the Printed Text of the Greek New Testament" (1854), and "Remarks on the Prophetic Visions of Daniel (1847). Besides these he edited "The Englishman's Greek Concordance," and "The Englishman's Hebrew Concordance," and translated Gesenius's "Hebrew Lexicon" (1847). He died in Plymouth, April 24, 1875.

**Trehalose,** in chemistry, $C_{12}H_{22}O_{11}2H_2O$; a saccharine substance extracted from trehala manna by boiling alcohol. It forms shining rhombic crystals, soluble in water and in boiling alcohol, insoluble in ether, and melts at 100°. Boiled with dilute sulphuric acid, it is converted into dextro-glucose; with dilute nitric acid, it yields oxalic acid; in contact with yeast it passes slowly into the alcoholic fermentation. An aqueous solution of trehalose has a dextro-rotatory power [a] = + 199°.

**Treille,** in heraldry, a lattice; it differs from fretty in that the pieces do not interlace under and over, but cross athwart each other, and are nailed at the joint. Called also trellis.

TREILLE.

**Treitschke, Heinrich von,** a German historian; born in Dresden, Germany, Sept. 15, 1834; was educated at Heidelberg, Tübingen, Bonn and Leipsic. He devoted himself to the study of history and became Professor of History at Freiburg in 1863, and held the same chair at Heidelburg in 1867–1874. In the latter year he accepted the similar chair at the University of Berlin. He was the author of "Ten Years of German Struggles"; "Socialism and its Patrons"; "Two Emperors"; and the "History of Germany in the Nineteenth Century," which was his principal work, but was left unfinished. He died in Berlin, April 28, 1896.

**Trelawney, Sir Jonathan,** an English clergyman; from Westminster passed in 1663 to Christ Church, Oxford, and became bishop in turn of Bristol (1665), Exeter (1688), and Winchester (1707); he was one of the Seven Bishops tried under James II., and is the hero of R. S. Hawker's well-known ballad, "And shall Trelawney die." This was based on a contemporary refrain, the strong feeling aroused among the Cornishmen due rather to Trelawney's being head of an ancient Cornish house than to his being a bishop or even a martyr in a good cause. Trelawney died in 1721.

**Trelawny, Edward John,** an English author; born in Cornwall, March 10, 1792. He is remembered as a picturesque and somewhat theatrical adventurer (supposed to be drawn by Byron in "The Corsair"), the friend of Byron, Shelley, etc., and Byron's companion (1823) in the Greek war of liberation. He wrote a novel called "Adventures of a Younger Son" (1830); but his best-known work is "Recollections of the Last Days of Shelley and Byron" (1858), reissued in 1878 as "Records of Byron, Shelley, and the Author." His body was cremated, and the ashes interred near Shelley's at Rome. His portrait is preserved in Millais's painting "The Northwest Passage." He died in Sompting, Sussex, Aug. 13, 1881.

**Tremadoc Slates,** in geology, Sedgwick's name for the upper beds of the Cambrian formation, corresponding to part of Barrande's Primordial zone. They were first met with at Tremadoc, and next traced to Dolgelly. Dr. Hicks found and carefully

examined them at St. David's promontory and Ramsey Island, in South Wales; and finally Mr. Callaway showed that the Shineton shale of Shropshire was of the same age. They are dark earthy flags and sandstones, with at least 84 fossil species, those of North somewhat differing from those of South Wales. Many new genera of Trilobites appear: *Crinoidea, Asteroidea, Lamellibranchiata,* and *Cephalopoda* are met with for the first time. In North Wales there are nine pteropods, mostly of the genus *Theca,* and phyllopod crustacea have been found.

**Tremain, Henry Edwin,** an American military officer; born in New York city, Nov. 14, 1841; was graduated at the College of the City of New York in 1860, and at the Columbia Law School in 1867; served in the Union army in 1861–1866; was brevetted Brigadier-General of volunteers. He greatly distinguished himself at the battle of Resaca, Ga., May 15, 1864, and for his conduct in that action received a Congressional medal of honor. He was first assistant United States attorney of New York in 1873–1877; and colonel of the veterans of the 7th regiment New York National Guards in 1887–1891. His publications include "Sailor's Creek to Appomattox Court House; or the Last Hours of Sheridan's Cavalry"; and many addresses and papers. He died Dec. 9, 1910.

**Tremandra,** in botany, the typical genus of, *Tremandraceæ.* Shrubs with stellate downy, purple flowers with a five-cleft calyx, five petals, 10 stamens, and two-celled anthers. Known species two, from Western Australia.

**Tremandraceæ,** in botany, poreworts; an order of hypogynous exogens, alliance Sapindales. Slender heath-like plants, generally with glandular hairs. Leaves alternate, or whorled, exstipulate, with axillary one-flowered pedicels; flowers in most species large, showy; sepals deciduous, four or five, slightly adhering at the base, equal, valvate in æstivation; petals the same number, large, deciduous, involute in æstivation; stamens 8 or 10; anthers two or four-celled; opening by a pore at the apex; styles one or two; ovary two-celled, each cell with one to three pendulous ovules. Fruit capsular, two-valved, two-celled; seeds with a hooked appendage at the apex. Natives of Australia. Genera 3, species 16.

**Trematoda,** in zoölogy, flukes, or suctorial worms; an order of the class Annelida, with two groups, Distoma and Polystoma. Leaf-like parasites, for the most part internal, but some external, provided with one or more ventral suckers, a mouth and alimentary canal, but no anus or body cavity; integument of the adult not ciliated; sexes generally united in one individual. They are the *Sterelmintha* of Owen, and were included by Cuvier in his parenchymatous intestinal worms. The intestinal canal is often much branched, and possesses but one external opening, usually at the bottom of the anterior suctorial disk, and serving both as an oral and anal aperture. A water vascular system is present, consisting of two lateral vessels, generally opening on the surface by a common excretory pore. The nervous system consists of two pharyngeal ganglia. The young may be developed directly into the adult, or may pass through a complicated metamorphosis, varying in different cases, and one of the early stages of their existence is often passed in the interior of fresh-water mollusks, whence they are transferred to a vertebrate host. In their adult state they occupy the most varied situations. The majority live in the intestines or hepatic ducts, the eyes, or blood-vessels of vertebrates; a few are ecto-parasitic, and live on the skin and gills of fishes, crustaceans, mollusks, etc. The genus *Distona* may be taken as the type of the order. The genus *Gynæcophorus,* in which the sexes are distinct, occurs abundantly in the blood-vessels of man in Egypt, South Africa, and the Mauritius, and its presence has also been detected in monkeys.

**Trematosaurus,** in palæontology, a serpentiform of *Labryinthodontia,* of which little definite is known. Two species are generally recorded by taxonomists: *T. braunii,* and *T. ocella,* both from the Bunter Sandstone of Bernburg.

**Trematospira,** a genus of *Spiriferidæ,* with seven species, ranging from the Upper Silurian to the Middle Devonian of the United States. It appears to be closely related to *Retzia.*

**Trembelores,** or **Tremblores,** the name given in South America to small earthquakes, consisting of a series of rapidly recurring vibratory movements, not sufficiently powerful to create damage.

**Trembling Tree,** in botany, *Populus trepida;* an American tree, about 40 feet high, akin to the aspen, of which some botanists consider it to be only a variety. It has a sub-orbiculate leaf, with an abruptly acuminate point, and two glands at its base; young leaves silky on the upper surface, old ones glabrous.

**Tremella,** the typical genus of *Tremellini* It consists of a tremulous gelatinous mass, generally more or less waved and sinulated, free from papillæ and tubercles. They vary greatly in form, being brain-like, club-shaped, orbicular, etc, and in color, being white, yellow, orange, rose-colored, purple, etc. A common species, *T. mesen-*

*teria*, is conspicuous in winter in hedges from its orange tint.

**Tremellini**, an order or sub-order of hymenomycetous Fungals, the species of which are of a gelatinous texture, sometimes, though rarely, with a cretaceous nucleus, their hymenium in the more typical genera covering the whole surface without any definite upper or under side; sporophores scattered, often lobed or quadripartite; spores often producing secondary spores of spermatia. They grow upon branches or stumps of trees, in crevices of the bark, or on the dead wood, rarely on the ground. Found chiefly in temperate climates, though some are tropical. A widely distributed representative is the jew's-ear.

**Tremolite**, a mineral, a variety of hornblende. It is a silicate of calcium and magnesium, is white or colorless, and usually occurs in long, prismatic crystals.

**Tremoctopus**, in zoölogy, a sub-genus of *Octopus*, with three species, from the Atlantic and Mediterranean. Some or all of the arms are webbed half-way up, and there are two large aquiferous pores on the back of the head.

**Tremolant**, an organ and harmonium stop which causes the air as it proceeds to the pipes or reeds to pass through a valve having a movable top, to which a spring and weight are attached. The up-and-down movement of the top of the valve gives a vibratory movement to the air, which similarly affects the sound produced. On American organs, a fan-wheel by rotating in front of the wind chest causes a tremolo.

**Tremont**, the early name by which Boston, Mass., was known. It arose from the three hills on which the city is built. It has also been called Trimount, or Trimountain.

**Trench, Richard Chenevix**, an English clergyman; born in Dublin, Ireland, Sept. 9, 1807; was graduated at Trinity College, Cambridge, in 1829. He entered the Church, and became curate at Hadleigh (1833–1835), incumbent at Curdridge (1835–1840), curate to Archdeacon Wilberforce at Alverstoke (1840–1844), rector of Itchenstoke (1844–1845), was Hulsean lecturer 1845–1846, Professor of Theology at King's College, London (1846–1858), dean of Westminster (1856–1863), and was finally consecrated archbishop of Dublin, Jan. 1, 1864. He was the author of a collection of poems, and a popular writer on philological and theological subjects. His works include: "Notes on the Parables" (1841); "Notes on the Miracles" (1846); "On the Study of Words" (1851; "Proverbs and Their Lessons" (1853); "Synonyms of the New Testament" (1854); "English, Past and Present" (1855); "On Plutarch" (1874); "Lectures on Mediæval Church History" (1878); and many others. He died March 28, 1886.

**Trenchard, Stephen Decatur**, an American naval officer; born in Brooklyn, N. Y., July 10, 1818; was appointed to the navy in 1834; took part in the Seminole War in Florida; served on board the "Saratoga" in the war with Mexico; was in the "Powhatan" on her diplomatic cruise to China and Japan in 1857–1860; and commanded the "Rhode Island" in both attacks on Fort Fisher. He was promoted captain in 1866; commodore in 1871; served on the examining board in 1871–1872, and as light-house inspector and on headquarters duty in 1873–1875; became rear-admiral in 1875; commanded the North Atlantic squadron in 1876–1878, and was retired in 1880. He died in New York city, Nov. 15, 1883.

**Trenck, Friedrich von der, Baron**, a Prussian officer, celebrated for his adventures and misfortunes; born in Königsberg in 1726, and made such rapid progress in his studies, that, at the age of 17, he was presented to the king, Frederick II., as a student who was well worthy the royal patronage. Frederick rapidly advanced him in the army, and manifested much regard for him; but the accomplishments of Trenck having won the heart of Princess Amelia, the king's sister, his enemies took advantage of some letters that fell into their hands, and had him accused and arrested. He was imprisoned in the fortress of Glatz, but contrived to effect his escape. He then visited the N. of Europe, Austria, and Italy. In 1758, he was seized at Danzic, and was conveyed to Magdeburg, where, loaded with irons, he was for years incarcerated. On procuring his liberation, in 1763, he withdrew to Vienna, after which he went to Aix-la-Chapelle, where literature, politics, and commerce alternately occupied his attention. He next went to reside at his castle of Zwerbeck, in Hungary, and while there he published his "Memoirs," a book which was greedily read all over Europe. In 1791, he settled in France, joined the Jacobins, and in 1794 was charged with being a secret emissary of the King of Prussia, and died by the guillotine.

**Trendelenburg, Friedrich Adolf**, a German philosopher; born in Eutin, Germany, Nov. 30, 1802. He set forth the ethical aspect of his philosophy in the treatise "The Ethical Idea of Right and Law," and the æsthetic aspect in "Niobe" (1846) and "The Cathedral of Cologne" (1853). He wrote also "Natural Justice on the Ground of Ethics" (2d ed. 1860). His principal claim to distinction as a thinker rests on his acute criticism of the systems of Kant and Hegel. He died in Berlin, Jan. 24, 1872.

**Trent,** an old town of Austria in the Tyrol; on the left bank of the Adige; 51¼ miles N. N. E. of Verona. It has two suburbs, San Martino and Santa Croce, and in its environs villages rise beautifully above one another on the mountain slopes. Of the town, which is quite Italian in its character, the finest squares are the Piazza d'Armi and the Piazzi del Duomo, the latter adorned with a fountain, and containing the courts of justice. Among the 15 churches the finest are the Cathedral, a Romanesque basilica, with two domes, founded in 1048, begun in its present form in 1212, and completed in the 15th century; Santa Maria Maggiore, where the celebrated Council of Trent sat from 1545–1563, containing an admirable organ, and adorned with portraits of the members of the council; and the Church dell' Annunziata, with a high cupola resting on four pillars. Other buildings are the town hall, the Palace of Justice, the theater, and the Palazzo Buon Consiglio, formerly the residence of the prince-bishops, now a barrack. The town has two monasteries, a theological institute, an upper gymnasium, and a public library and museum. The industries are silk spinning and weaving, dyeing, iron founding, and the maufacture of cloth, pottery, and cards. In the vicinity are great marble quarries. Trent was a Roman colony, became in the 4th century the seat of a bishop, and in 574 of a Lombard duke. In 1027 Konrad II. granted to its bishops princely rank and the fief of the town. The bishropic was secularized in 1803, and added to the Austrian crown-lands. Pop. (1900) 24,868.

**Trent, Council of,** the 18th in order and the first in importance of the "Œcumenical" councils recognized by the Roman Catholic Church; was called forth by the Reformation in the 16th century, and demanded by both parties in the contest, for the reform of church discipline and the settlement of the points of controversy. After being repeatedly postponed, it was convened at Trent as an exclusively Roman council by Pope Paul III., Dec. 13, 1545. In March, 1547, it was transferred to Bologna, but was reopened at Trent, by Pope Julius III., May 1, 1551. It was broken up, Jan. 18, 1562, in consequence of the victorious advance of the Elector Moritz, but was recalled by Pope Pius IV., Jan. 18, 1562, and reached its close, at its 25th session, Dec. 4, 1563. Its decrees and canons, which were confirmed by a bull of Pius IV., Jan. 26, 1564, are drawn up with much clearness and precision, though the doctrines of the Protestants are often exaggerated or falsified. They were immediately acknowledged in Spain, Portugal, Italy, Poland, and Catholic Germany, and, in their doctrinal part, in France. The principal articles of faith decreed, with anathemas, were the canon of Scripture, with the Church as sole interpreter, progressive justification, the seven sacraments. transubstantiation, purgatory, the invocation, veneration, celibacy of the clergy, and auricular confession. The Decreta and Canones were first published by Paul Manutius (Rome, 1564), and have been frequently edited; the best edition is that by Schulte and Richter (1853), the latest that by Pess (1877). The history of the Council of Trent has been written by the liberal Sarpi and the Ultramontane Pallavicino.

**Trent, William Peterfield,** an American author; born in Richmond, Va., Nov. 10, 1862; was graduated at the University of Virginia in 1884; and in 1888 became Professor of English and of History in the University of the South. In July, 1900, he was appointed Professor of English Literature at Columbia University, New York city. He made a special study of Southern men and times, and published: "Life of William Gilmore Simms"; "English Culture in Virginia"; "Southern Statesmen of the Old Régime"; "Balzac's Comédie Humane"; "John Milton"; "Authority of Criticism"; etc.

**Trent Affair.** In October, 1861, Capt. Charles Wilkes, U. S. N., intercepted at sea the British mail steamer "Trent," bound from Havana to St. Thomas, and took off two Confederate commissioners, accredited to France, Messrs. Mason and Slidell, who were among her passengers. They were taken to Boston, and imprisoned in Fort Warren, but were released on Jan. 1, 1862, on the demand of the British government, and permitted to proceed to Europe. The affair created intense excitement at the time, but Secretary Seward accepted England's demand as an adoption of the American doctrine which denied the right of search, and on that ground replied that the prisoners would be cheerfully given up.

**Trente et Quarante.** See Rouge et Noir.

**Trente-un.** See Rouge et Noir.

**Trenton,** a city and county-seat of Grundy co., Mo.; on the Crooked Fork of Grand river, and on the Chicago, Rock Island and Pacific railroad; 102 miles N. E. of Leavenworth, Kan. It contains Avalon College (United Brethren), a court house, churches, National and other banks, and several newspapers. It has flour and woolen mills and an assessed property valuation exceeding $1,200,000. Pop. (1890) 5,396; (1910) 5,656.

**Trenton,** a city, capital of the State of New Jersey, and county-seat of Mercer co.; on the Delaware river, the Delaware and Raritan canal, and the Philadelphia and Reading and the Pennsylvania railroads;

57 miles S. W. of New York. The city is built at a sharp bend in the course of the Delaware river, which is here spanned by two iron bridges connecting it with the suburb, Morrisville.

*Business Interests.*— Trenton is noted as a manufacturing city. The extensive wire works of the Roeblings, the builders of the East River Bridge are located here. There are also about 30 potteries, manufacturing all kinds of ware. Here, too, are several brickyards, tile establishments, flour and woolen mills, iron and steel works, rubber and oilcloth plants, a large brewery, and other industries. There are 3 National banks in operation, with a capital of $1,250,000. The city has many daily, weekly and monthly periodicals. There is an assessed property valuation of over $33,000,000, and a total bonded debt of about $3,000,000.

*Public Interests.*— Trenton is compactly built; has many wide and well paved streets; four beautiful parks, and many elegant residences. There is a good water supply, an excellent sewerage system, efficient police and fire departments, and a good public school system. The city is the seat of a Protestant Episcopal and of a Roman Catholic bishop. Here are also several hospitals, a public library, the State library, court house, State School for Deaf Mutes, the State Capitol, the State penitentiary, a United States government building, State Normal School, State arsenal, and many imposing churches.

*History.*— The site of Trenton was settled as early as 1679, by Mahlon Stacy and other Quakers. Judge Trent purchased a large plantation here about 1715, and the place became known as Trent Town, subsequently shortened to Trenton. It became the State capital in 1790, but prior to that year the Legislature often met here. The town was incorporated in 1792. After the Revolutionary War the Continental Congress once met here and discussed the feasibility of making Trenton the National capital, but State jealousies defeated the movement. On Dec. 25, 1776, the town was the scene of night attack by Washington on the British troops, whom he surprised by crossing the Delaware, when the floating ice was supposed to have rendered it impassable. A monument erected by the National and State governments commemorates this event. Pop. (1890) 57,458; (1900) 73,307; (1910) 96,815.

**Trenton Falls,** a series of beautiful cascades in West Canada Creek, Oneida co., N. Y.; 15 miles from Utica. They are six in number, and appearing at intervals, find their way through a ravine some 2 miles long. The total descent is 312 feet.

**Trepang,** in zoölogy, a popular name for several edible tropical species of the *Holothuriodea,* especially applied to *H. edulis,* and to its dried flesh. It is a slug-like animal, from the E. seas, from six inches to two feet in length, living among seaweed or in sand or mud, and moving by the alternate extension and contraction of the body. The trepang forms an important article of food in China. About 35 varieties are enumerated by traders, but only five or six have any real commercial value. To prepare them for the market the viscera are removed, and the animals boiled for about 20 minutes, then soaked in fresh water, and afterward smoked and dried. The curing process occupies about four days, during which the trepang must be kept very dry, for it readily absorbs moisture from the atmosphere. The final product is an uninviting, dirty-looking substance, which is used to prepare a sort of thick soup, a favorite dish in China and the Philippine Islands. Trepang is worth from $2.00 to $3.00 a bushel, according to the variety and the perfection with which it is cured.

**Trepanning,** the operation of cutting a circular opening into the skull by means of a surgical instrument called a trepan or trephine. This consists of a handle, to which is fixed a small hollow steel cylinder, of about ½ to 1 inch in diameter, having teeth cut on its lower edge so as to form a circular saw. The operation of trepanning is resorted to for the purpose of relieving the brain from pressure; such pressure may be caused by the depression of a portion of the cranium, or it may be produced by an extravasation of blood, or by the lodgment of matter betwixt the skull and the dura mater, ocasioned by a blow upon the head, or the inflammation of the membranes of the brain.

**Trephine,** in surgery, an improved form of the trepan, an instrument for taking a circular piece out of the cranium. It is a cylindrical saw, with a cross-handle like a gimlet and a center pin (called the perforator), around which it revolves till the saw has cut a kerf sufficient to hold it. The center pin may then be withdrawn. The saw is made to cut through the bone, not by a series of complete rotations, such as are made by the trepan, but by rapid half rotations alternately to the right and left, as in boring with an awl. The trephine is sometimes

TREPHINE.

worked by a revolving brace like that of the carpenter, and has been socketed on a stem with three legs, and turned by one hand while the socket is held by the other. The trephine for the antrum is a small crown saw set in the end of a handle. It is used for entering the antrum through a tooth socket. The trephine differs from the trepan in having its crown fixed on and worked by a common transverse handle, instead of being turned by a handle, like a wimble or center bit, as is the case with the trepan, and thus avoiding the loss of sound bone.

**Trepomonadidæ,** in zoölogy, a family of pantostomatous *Flagellata*, with a single genus, *Trepomonas*. Animalcules naked, free-swimming, asymmetrical; two flagella separately inserted; no distinct oral aperture.

**Trepomonas,** the type genus of *Trepomonadidæ*, with a single species, *T. agilis*, from marsh water with decaying vegetable substances.

**Treron,** in ornithology, tree pigeons; a genus of *Columbidæ* (the Vinago of Cuvier), with 37 species, ranging over the whole Oriental region, and E. to Celebes, Amboyna, and Flores, and the whole Ethiopian region to Madagascar. Formerly made the type genus of the lapsed family *Treronidæ*.

**Treronidæ,** in ornithology, a family of *Columbacei*, approximately equivalent to the genus *Treron*. Bill large, strong, compressed at sides, tip very hard, hooked; nostrils exposed; tarsi short, partly clothed with feathers below tarsal joint; the whole foot formed for perching and grasping; claws strong, sharp, and semicircular.

**Trescot, William Henry,** an American diplomatist; born in Charleston, S. C., Nov. 10, 1822; was graduated at Charleston College in 1840; admitted to the bar in 1843; assistant Secretary of State from June, 1860, till South Carolina seceded; represented that State in Washington after the war till the differences arising from the reconstruction acts were adjusted. He settled permanently in Washington in 1875, and there resumed the practice of law; was counsel for the United States before the Fishery Commission at Halifax in June, 1877; was a commissioner with General Grant to arrange a commercial treaty with Mexico in 1882; and served in other important diplomatic capacities. His publications include: "A Few Thoughts on the Foreign Policy of the United States" (1849); "Diplomatic System of the United States" (1853); "The Diplomatic History of the Administrations of Washington and Adams" (1857); etc. He died in Pendleton, S. C., May 4, 1898.

**Trespass,** in law, a physical interference with the person or property of another. However innocent the act, if it be voluntary, a legal wrong is done. Thus, if pursued by a wild beast you deliberately take refuge in another man's house, you commit a trespass; but if you rush there in mere blind fear, you do not. Again, if you drive in so careless a manner as to hurt any one, though unintentionally, this is a trespass. If animals or, indeed, any chattels are on a man's land doing damage, they may be seized and impounded till compensation be made. This remedy is called distress damage feasant. It is similar to distress at common law — *e. g*, there is no power of sale. If a dog worry cattle or sheep, the owner is liable. Formerly it was necessary to prove *scienter* — *i. e.*, knowledge by the master of the animal's vicious disposition. *Scienter* must still be proved in other cases, and generally when animals, not savage by nature, do hurt — a legal doctrine quaintly parodied in the vulgar saying, that the dog is entitled to his first bite. Even in complete absence of real injury an action for trespass will lie, for, says Lord Denman, those rights are an extension of that protection which the law throws round the person. A verdict of a farthing damages is, however, the frequent and appropriate compensation for injury without damage (*injuria sine damno*).

As will be seen, there are various kinds of trespass: (1) trespass to goods, which consists in damaging them physically, as asportation — *i. e.*, carrying them away; (2) trespass to the person, which is either battery, assault, or false imprisonment. Battery is an active attack on any one. Assault is an attempted battery; both are criminal offenses as well as civil wrongs. False imprisonment is usually classed among the latter. It consists in depriving a man of his liberty without lawful excuse. Compelling any one to submit by the exhibition of superior force, though no actual violence be used, is a wrong of this nature. If a constable intervene, the question is, did he do so of his own initiative, or at the prompting of a third party? In the second case only, even if the arrest be illegal, can the third party be held liable for the false imprisonment. Trespass to the person may be justified on the ground that a man was acting in self-defense, that it was necessary to stop a breach of the peace, to apprehend a felon, or to assist police officers in the execution of their duty, and that the person arrested was dangerous to himself and others. Various acts give power to arrest those found committing certain specified misdemeanors.

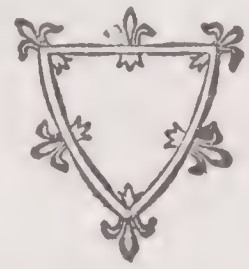
As regards trespass to land, since a plaintiff must succeed by the strength of his own, not by the weakness of his adversary's

case, bare possession is a good title as against a wrong doer; so the occupier may turn out an intruder, using, on his refusal to depart peaceably, as much force as is necessary. If the possessor be forcibly turned out, he may forcibly reënter, even though outer doors be broken open to effect the purpose. But this must be done immediately, otherwise the owner, though entitled to possession, will, if he use violence, render himself criminally liable under the statutes of forcible entry. In making a distraint for rent, or in levying an execution, but not executing criminal legal process, it is a trespass to break open the outer door. Though the general rule is that an entry on another land is a trespass, yet in certain cases of necessity an entry is excused — *e. g.*, to abate a nuisance, or to prevent the spread of fire. A customary right of recreation or right of way will excuse what would otherwise be a trespass. Cut glass or spikes on a wall are allowable as a defense against intruders; but not man traps or spring guns (except inside a dwelling house), at least since 1827. Even before that a trespasser could recover for damages so done to him, unless he had notice of the existence of the engines in question. The mere act of trespassing on another's land is not a criminal offense, but by statute it is when in pursuit of game, on railways, on places where explosives are stored or animals afflicted with contagious disease are confined. Besides the remedies for trespass — viz., forcible expulsion and an action for damages — an injunction may be granted, even for a bare trespass, since the Judicature Act of 1873. The law of the United States is based on the English law.

The term trespass, in Scotch law, is borrowed from that of England. It is restricted to trespass to land. The law on the subject is generally the same as in the rest of the United Kingdom. The Trespass Act, 1865, provides a summary form of punishment for those who camp upon open land, or lodge in premises or enclosures without leave. Against mere trespassers an interdict may be obtained.

**Trespass Offering,** an offering among the Jews, in expiation of a trespass. It was closely akin to the sin offering, and consisted of a ewe lamb, or kid, or a ram without a blemish. After being killed its blood was to be sprinkled, the fat burned on the altar, and the flesh eaten by the priests in the holy place. The trespasses for which it made atonement were sins of dishonesty, falsehood, carrying hurtful consequences to others, and combined with the trespass offering, compensation was to be made for the wrong inflicted (Lev. v: 14–19; vi: 1–8; vii: 1–7; etc.).

**Tressure,** in heraldry, the diminutive of the orle, and generally reckoned one-half of that ordinary. It passes round the field, following the shape and form of the escutcheon, whatever shape it may be, and is usually borne double. When ornamented with fleur-de-lis on both sides, it is termed a tressure flory-counterflory, the flowers being reversed alternately. A tressure flory is when the flowers are on one side only of the tressure, with the ends of them inward.



TRESSURE FLORY.

**Trevelyan, Sir Charles Edward,** a British statesman; son of Archdeacon Trevelyan of Taunton; born April 2, 1807; was educated at the Charterhouse and Haileybury College; and entering the East India Company's Civil Service, held important posts under Lords Auckland and Bentinck. His vigorous action promoted the abolition of Indian transit and town dues, and the introduction of educational institutions on a European model. In 1840 he was appointed assistant secretary to the treasury, and in 1848 was made K. C. B. for his attempts to relieve the distress caused by the Irish famine. With Sir Stafford Northcote and others he was long engaged in the revision of the civil establishments which led to the Civil Service being thrown open to public competition. He was governor of Madras from 1859 to 1860, when he was recalled for protesting against the new taxes then imposed by the government of India, though the imperial government accorded him a highly eulogistic vote of thanks. In 1862 he became financial minister in India, a post in which he inaugurated important fiscal reform and a vast extension of public works, and which he resigned on account of ill health in 1865. On his return he published two able pamphlets on army reform, a subject on which he had given evidence before the Royal Commission of 1857. Having subsequently devoted his attention to metropolitan charities, he was created a baronet in 1874. Trevelyan married Miss Hannah More Macaulay in 1834, and was the author of "Education of the Irish People" (1838); "The Irish Crisis" (1848); "Purchase System in the British Army" (2d ed. 1867); "The British Army in 1868" (1868); etc. He died in London, March 23, 1879.

**Trevelyan, Sir George Otto,** a British statesman; son of the preceding; born in Rothly Temple, Leicestershire, July 20, 1838, and passing from Harrow to Trinity College, Cambridge, graduated as second classic. He entered the East India service by competition, but soon returned from In-

dia and was elected Liberal representative of Tynemouth in 1865, and of the Scottish Border Burghs in 1868. In the second Gladstone administration he was appointed Civil Lord of the Admiralty (December, 1868), but resigned office in July, 1870, being opposed to the Educational Bill of the ministry. He strongly advocated, in and out of Parliament, a sweeping army reform, including the abolition of purchase, effected in 1871. The Volunteer movement had his active support, and he opposed the Regimental Exchanges Bill of 1875. With impetuous rhetoric and fiery invective he has severely criticized the Conservative foreign policy, declaring that war with Russia was only avoided by the resignation of "the two brave peers" (Carnarvon and Derby), and that apart from the question of justice, the Afghan War was opposed to the interests of the Indian empire. On Feb. 22, 1878, he moved the resolution on the extension of the County Franchise, which was lost by 52 votes. Trevelyan's literary works comprise: "Letters from a Competition Wallah" (1864); "Cawnpore" (1865); "Ladies in Parliament and other Poems" (1869); "Life and Letters of Lord Macaulay" (2 vols. 1876; 2d ed. 1877); "The Early History of Charles James Fox" (1880); etc.

**Trèves,** a city of Rhenish Prussia; on the Moselle; in a valley between low vine-covered hills of ruddy sandstone; 69 miles S. W. of Coblenz and 111 S. S. W. of Cologne. The river is crossed here by an eight-arch bridge, 623 feet long, whose Roman piers date from 25 B. C. "A quiet, old-fashioned town, Trèves," Freeman says, "has a body of Roman remains far more numerous and varied, if not individually more striking, than any other place north of the Alps can show." These include the "Porta Nigra," 118 feet long, and 95 high, one probably of the five gates by which Trèves was entered in Constantine's time; the so-called Roman baths (more probably part of an imperial palace); and a basilica built of Roman brick by Constantine for a court of justice, but demolished in great measure to make room for an electoral palace in 1614. This, however, was removed, and the basilica fitted up for a Protestant church in 1856. Beyond the walls are the ruins of an amphitheater that could seat 30,000 spectators; and 6 miles off is the "Igelsäule" or "Heidenthurm," a monumental column, 71 feet high, sculptured with bas reliefs of the 2d century. The cathedral of SS. Peter and Helena is an interesting structure of various antiquity, but chiefly in the early German Romanesque style of the 11th century. The most famous of its relics is the seamless or "Holy Coat," which consists of "connected fragmentary particles of material." Said to have been brought to Trèves by the Empress Helena, it is first referred to in 1106 by an anonymous monk, and was not a source of revenue till 1512. It was visited by nearly 2,000,000 pilgrims in 1891, the first time of exhibition since 1844. A "Holy Coat" is also shown at Argenteuil and in 19 other places. Connected with the cathedral by a cloister is the beautiful Liebfrauenkirche (1243); and there is a library of over 100,000 volumes and many MSS., among them the "Codex Aureus" of the Gospels, presented to the abbey of St. Maximin by Charlemagne's sister, Ada. A university, founded in 1472, was suppressed in 1798. The industries comprise manufactures of woolens, cottons, and linens, besides a brisk trade in corn, timber, and Moselle wine. Pop. (1905) 46,698.

Trèves, which claims to be 1,300 years older than Rome, derives its name from the Treviri, a Gallic or, more probably, a Belgic people, who in Cæsar's time inhabited a large district between the Meuse and the Rhine. Their capital, Augusta Trevirorum, seems to have become a Roman colony in the reign of Augustus, and ultimately was the headquarters of the Roman commanders on the Rhine, and a frequent residence of the emperors, especially Constantine. Sacked by Attila in 451, it passed to the Franks in 463, to Lorraine in 843, to Germany in 870, and back to Lorraine in 895, and was finally united to Germany by the Emperor Henry I. The Archbishop of Trèves was, as chancellor of Burgundy, one of the electors of the empire, a right which originated in the 12th or 13th century, and which continued till the French Revolution. The last elector removed to Coblenz in 1786; and Trèves was the capital of the French department of Sarre from 1794 till 1814, since which time it has belonged to Prussia.

**Trevisa, John,** an English poet; born in Cornwall about the middle of the 14th century; was educated at Queen's College, Oxford, where he was a friend of Wyclif's; became vicar of Berkeley, in Gloucestershire, and canon of the collegiate church of Westbury. He spent most of his leisure in turning Latin books into English. His chief works are a translation of Higden's "Polychronicon" (1837), one of the earliest specimens of English prose, of Occam's "Dialogue between a Soldier and a Clerk," and of "Bartholomæus de Proprietatibus Rerum," which last, a very mine of rare English words, stands in the list of proposed reprints of the Early English Text Society. Caxton said that Trevisa had also translated the Bible; but his version, if it ever existed,

is not known to be extant. He is said to have died in 1412.

**Trevithick, Richard,** an English inventor; born in Illogan, Cornwall, April 13, 1771. In 1797 he succeeded his father as a leading engineer in Cornish mining. Among his first inventions was an improved pump, which soon came into universal use in deep mining. He next perfected a high pressure steam engine, and began to experiment in the construction of locomotive engines. Passengers were first conveyed by steam by means of his road locomotive in 1801, and he soon after successfully worked a tramroad locomotive. His ideas were afterward taken up and developed by Stephenson. He was the first to recognize the value of iron in ship building, and the application of steam to agriculture. His request for recognition and reward for his numerous inventions was disregarded by government. He died in Dartford, Kent, April 22, 1833.

**Trevor, Sir John,** an English statesman, eldest son of Sir John Trevor, of Trevallin, in Denbighshire, Wales; born in 1626. Both father and son were "halters in the Rebellion, and adherers to the usurper." The father sat in the Long Parliament, but favored the Restoration, while the son became a gentleman of the bedchamber to Charles II., and was dispatched in 1668 as special envoy to France. On his return he was knighted, and in September appointed to be a secretary of state, an office which he held till his death. In consequence of his opposing the French policy recommended by the Duke of York, he lost his influence, was ousted from the cabinet in 1670, and found himself "merely in the skirts of business." He died one year before his father, May 28, 1672.

**Trevor, Sir John,** an English politician; cousin of the preceding; born in 1633. He was, by his mother, cousin to the infamous Jeffreys. His rise was rapid through the influence of his powerful relative, and he was knighted, 1671, became king's counsel, 1678, member of the House of Commons, 1679; speaker, May, 1685; master of the rolls, Oct. 20, 1685, and a member of privy council, July 6, 1688. After the Revolution he obtained the favor of William III., and was engaged by him to bring over by bribes the more obstinate members of the House of Commons, of which he was again elected speaker, March 20, 1690. For some years he held this position, till in March, 1695, the corrupter of others was discovered to have been himself corrupted; and having been found guilty of receiving bribes by a parliamentary committee, he had the mortification as Speaker of putting to the House the question of his own shame, and, in declaring the issue of the vote, of publishing his own guilt. He never returned to the House, and was, a few days later, formally expelled. He retained the position of Master of the Rolls for the remaining 22 years of his life, "to the great encouragement of prudent bribery for ever after." He died May 20, 1717.

**Trewia,** in botany, the typical genus of *Trewiaceæ*. Leaves opposite, entire, without stipules; flowers diœcious, males in long racemes, females axillary, solitary; males, sepals three to four, stamens many; females, calyx three to four-cleft, style four-cleft; drupe five-celled, each cell with a single seed. Known species one, *T. nudiflora*, an Indian deciduous tree, growing in the sub-Himalayas. The wood is used for drums and agricultural implements.

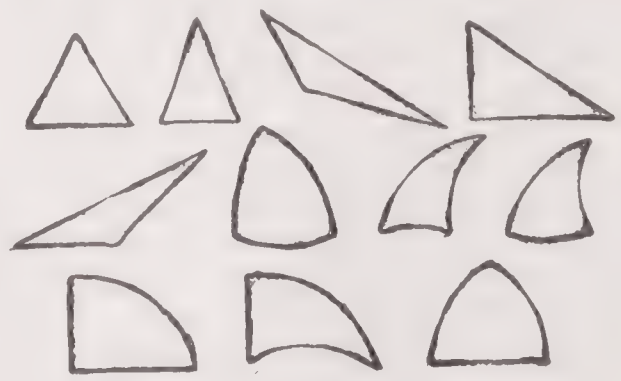
**Triacanthina,** in ichthyology, a group of *Scleroderm*i, with three genera, having the range of the family. The skin is covered with small, rough, scale-like scutes; dorsal, with from four to six spines; a pair of strong movable ventral spines joined to the pelvic bone.

**Triacanthus,** in ichthyology, a genus of *Triacanthina*, with five species ranging from the Australian seas to the N. of China. *T. brevirostris*, from the Indian Ocean, is the most common.

**Triad, Hindu.** See TRIMURTI.

**Triænops,** in zoölogy, a genus of *Phyllorhininæ*, with one species from Persia and another from East Africa. Noseleaf, horseshoe-shaped in front, tridentate behind; ears without a distinct antitragus, the outer margin of the ear conch arising from the posteriors of the eyelids.

**Triangle,** in building, a gin formed by three spars; a staging of three spars. In draughting, a three-cornered straight-edge,



TRIANGLES.

used in conjunction with the T-square for drawing parallel, perpendicular, or diagonal lines. It has one right angle, the two others being each of 45°, or one of 30° and the other of 60°. In ecclesiology, a symbol of the Holy Trinity represented by an equilateral triangle.

In geometry, a portion of a surface bounded by three lines, and consequently having three angles. Triangles are either plane, spherical, or curvilinear. A plane triangle

is a portion of a plane bounded by three straight lines called sides, and their points of intersection are the vertices of the triangle. Plane triangles may be classified either with reference to their sides or their angles. When classified with reference to their sides, there are two classes: (1) Scalene triangles, which have no two sides equal. (2) Isosceles triangles, which have two sides equal. The isosceles triangle has a particular case, called the equilateral triangle, all of whose sides are equal. When classified with reference to their angles, there are two classes: (1) Right-angled triangles, which have one right angle. (2) Oblique-angled triangles, all of whose angles are oblique; subdivided into (*a*) acute-angled triangles, which have all their angles acute; and (*b*) obtuse-angled triangles, which have one obtuse angle. The sides and angles of a triangle are called its elements; the side on which it is supposed to stand is called the base, and the vertex of the opposite angle is called the vertex of the triangle; the distance from the vertex to the base is the altitude. Any side of a triangle may be regarded as a base, though in the right-angled triangle one of the sides about the right angle is usually taken. The three angles of a plane triangle are together equal to two right angles, or 180°; its area is equal to half that of a rectangle or parallelogram having the same base and altitude; in a right-angled plane triangle the square of the side opposite the right angle is equal to the sum of the squares of the other two sides.

In music, a bar of steel bent into the form of a triangle, having an opening at one of the lower angles, so that the sides are of unequal length. It is suspended by one angle and struck with a small rod, and is sometimes introduced in brilliant musical passages. In pottery, a small piece of pottery, placed between pieces of biscuit ware in the seggar, to prevent the adherence of the pieces when fired. In surveying, since every plane figure may be regarded as composed of a certain number of triangles, and as the area of a triangle is easily computed, the whole practice of land surveying is nothing more than the measurement of a series of plane triangles.. Arithmetical triangle, a name given to a table of numbers arranged in a triangular manner, and formerly employed in arithmetical computation. It is equivalent to a multiplication table. The first vertical column consisted of units; the second of a series of natural numbers; the third of triangular numbers; fourth of pyramidal numbers, etc.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 1 | 1 | | | | | |
| 1 | 2 | 1 | | | | |
| 1 | 3 | 3 | 1 | | | |
| 1 | 4 | 6 | 4 | 1 | | |
| 1 | 5 | 10 | 10 | 5 | 1 | |
| 1 | 6 | 15 | 20 | 15 | 6 | 1 |

ARITHMETICAL TRIANGLE.

Curvilinear triange, a triangle whose sides are curved lines of any kind whatever; as, a spheroidal triangle, lying on the surface of an ellipsoid, etc.

Mixtilinear triangle, a triangle in which some of the lines are straight and others curved.

Spherical triangles take the names, right-angled, obtuse-angled, acute-angled, scalene, isosceles, and equilateral, in the same cases as plane triangles. A spherical triangle is birectangular, when it has two right angles, and tri-rectangular, when it has three right angles. A trirectangular triangle is one-eighth of the surface of the sphere, and is taken as the unit of measure for polyhedral angles. Two spherical triangles are polar, when the angles of the one are supplements of the sides of the other, taken in the same order. A spherical triangle is quadrantal, when one of its sides is equal to 90°.

**Triangle of Forces,** in mechanics, a term applied to that proposition which asserts that if three forces, represented in magnitude and direction by the sides of a triangle taken in order, act on a point, they will be in equilibrium; and conversely, if three forces acting on a point, and in equilibrium, be represented in direction by the sides of a triangle taken in order, they will also be represented in magnitude by the sides of that triangle.

**Triangle of Hesselbach,** in anatomy, a triangular interval at the part of the abdominal wall through which the direct inguinal hernia passes.

**Triangle of Scarpa,** in anatomy, a triangular depression between the muscles covering the outer side of the femur and the adductor muscles on the inner side. It affords a passage for the femoral artery.

**Triangulum,** in astronomy, the triangle; one of the 48 ancient constellations. It is of small size, and is situated S. E. of Andromeda, N. of Aries, and W. of Perseus. The largest star, Alpha Trianguli, is only of the third magnitude.

**Triangulum Australe,** in astronomy, the Southern Triangle; a S. constellation of small size, but having the three stars which define it so prominent that they are sometimes called the triangle stars. The constellation is between Pavo and Centaurus.

**Triangulum Minus,** in astronomy, the Lesser Triangle; an obsolete constellation of small size between Triangulum and Aries. It was established by Hevelius.

**Trianosperma,** in botany, a genus of *Cucurbiteæ*, akin to *Bryonia*, but having only three seeds. They are climbing plants, with tendrils and monœcious flowers. Stamens three, ovary three-celled. Fruit globular, fleshy. Natives of the West Indies and Brazil. *T. ficifolia*, called also *B. fici-*

*folia*, is an active purgative, and said to be a purifier of the blood. *T. tayuya* is given in Brazil in small doses as an emetic, and in large ones as a purgative.

**Trianthema,** in botany, a genus of *Sesuveæ*. Sepals oblong, colored on the inside; stamens 5 to 12; styles one or two, filiform; capsule, oblong, truncate, circumscissile. Weeds from the tropical parts of both hemispheres and the sub-tropics of Africa. *T. crystallina*, *T. monogyna* (*T. obcordata* of Roxburgh), *T. pentandra*, and *T. decandra*, are natives of India. The tender leaves and the tops of the second and third species are eaten by the natives; the seeds of the first also serve as food during famine. *T. pentandra* is used as an astringent in abdominal diseases, and is said to produce abortion. The roots of *T. decandra* and *T. monogyna*, the latter combined with ginger, are given as cathartics.

**Triassic System.** This forms the basement group of the Mesozoic or Secondary strata, and was formerly associated with the Permian system under the name of the New Red Sandstone. The term trias has reference to the threefold grouping of the system in Germany, where the strata are more fully developed than in Great Britain. In our area the system rests unconformably on the upturned and denuded edges of the Permian and older Palæozoic strata. It is well developed in the central plains of England, whence a long belt extends N. from Nottingham to the valley of the Tees, while another band stretches down the Severn valley into Devonshire. Small areas likewise occur in Dumfriesshire and near Elgin, and also in the N. of Ireland. The system, however, assumes more importance in Central Europe, where it occurs at the surface over a wide tract between the Thüringerwald in the E. and the Vosges Mountains in the W., and between Basel in the S. and Hanover in the N. N. of that region it continues underneath overlying formations, but appears again and again at the surface where these latter are wanting. Trias is also met with in Heligoland and the S. of Sweden. In all the regions now noted the strata appear to have been deposited in inland seas, and the following table gives the general succession of strata:

| | |
|---|---|
| Rhætic. | Dark shales, red, green, and gray marls, thin gray limestones, sandstones, and bone-beds (Penarth Beds); and in Germany occasional thin coal seams. |
| Upper Trias or Kemper. | Red, green, and gray marls and shales, and thin sandstones, with rock salt and gypsum. |
| | Red sandstones and marls (England); gray sandstones, marls, and clays, with thin coal seams (Germany). |
| Middle Trias or Muschelkalk. | Limestones and dolomites, with associated beds of rock salt, gypsum, and anhydrite. Not represented in England. |
| Lower Trias or Bunter. | Mottled red and green sandstones, marls, and conglomerates; with (in Germany) occasional beds of dolomite, rock salt, and gypsum. |

In the Alpine regions the Trias differs much from that of England and Germany. It attains a thickness of many thousand feet, and forms ranges of mountains. The lower division consists chiefly of fossiliferous limestones, the middle of shales, marls. limestones, and dolomites, while the Rhætic is built up mainly of limestones and dolomites. Thus in Northwestern and Central Europe we have one well-defined type consisting of strata which have accumulated for the most part in inland seas, while in the Alpine regions the character of the beds betokens more open water. In France isolated areas of Trias occur, some of which approximate in appearance to those of England, while others resemble those of Germany. In Spain and Portugal both the German and Alpine types are represented.

In North America the Trias is well developed, as in Nova Scotia, Prince Edward Island, the Connecticut valley; the W. side of the Hudson river, and S. W. through Pennsylvania into Virginia; North Carolina. Strata believed to be of the same age cover wide areas in the W. territories, extending from the E. borders of the Rocky Mountains into Alaska, British Columbia, and California. Brick-red sandstones and marls are a prominent feature in all those areas. Like the similar rocks of Europe they contain few fossils, but animal tracks and footprints are of frequent occurrence. On the whole the American strata above referred to resemble the English type of the Trias. But on the Pacific slope, in Northern California and Mexico, the strata yield a plentiful marine fauna, and resemble the type of the Alpine Trias. Rocks of triassic age have been recognized in Spitzbergen, in the Himalayas, and again in South Africa, in New South Wales, Victoria, and Queensland, where the series contains coal seams.

*Life of the Period.*—The predominant plants were cycads (Pterophyllum, Zamites, etc.), horsetails (Equiseta), ferns, and conifers, especially the cypress-like Voltzia. In the red beds of the Trias few fossils occur, our knowledge of the life of the period (more especially the invertebrate life) being derived from the Rhætic, the Muschelkalk, and the marine strata of the Alpine Trias. Foraminifera, sponges, star corals, and echinoderms were tolerably numerous. One of the most beautiful fossils is the lily encrinite (*Encrinus liliiformis*) of the muschelkalk. Among lamellibranchs myophoria, avicula, pecten, cardium were common forms. A number of palæozoic genera of gasteropods (*Loxonema*, *Murchisonia*, etc.) appear, commingled with newer forms. The same is the case with the cephalopods, such old genera as *Orthoceras*, *Cyrtoceras*,

and *Goniatites* occurring along with *Ceratites* and other species of the great tribe of Ammonites. This remarkable association of palæozoic and mesozoic genera is most notable in the Alpine Trias. In the same strata occur the earliest traces of dibranchiate cephalopods, represented by the internal bone or shell (belemnites). The triassic fishes are ganoids and placoids — the latter represented by spines and palate teeth (*ceratodus*). Labyrinthodonts abounded, and are known chiefly through their footprints, which are often plentiful in the red beds of the Trias. Some of these creatures attained a large size — the skull of one (*Mastodonsaurus*) measuring over three feet in length by two feet in breadth. Lizard-like reptiles (*telerpeton, hyperodapedon*) were numerous, while crocodiles (*stagonolepis*) made their first appearance. The same is the case of the extinct group of dinosaurs — terrestrial reptiles, some of which could walk on their hind feet, which were often only three-toed — their front feet being four-toed. The footprints of these dinosaurs are very numerous in some sandstones, and the three-toed impressions were at first supposed to be those of birds. They vary in size, the largest being nearly two feet long. Swimming reptiles (*Nothosaurus*) have also been recorded from the Trias. Another remarkable group of reptiles were represented by dicynodon, which had a horny beak and carried two large tusk-like teeth in the upper jaw. The Trias is further remarkable for having yielded the earliest relics of mammalia. They seem to have been small marsupials (*Microlestes, Dromatherium*), with some affinities to the little banded anteater of Australia.

*Physical Conditions.*—The British Triassic strata afford evidence of having, for the most part, been deposited in a great inland sea or salt lake, from the waters of which sodium chloride (rock salt), gypsum, and other chemically-formed materials were precipitated. This inland sea covered a large part of England, and extended N. into Southern Scotland and across what is now the area of the Irish Sea into the N. E. of Ireland. It is possible also that the same sea stretched into Northern France. Another but smaller lake is indicated by the red sandstones of Elgin. The lands surrounding these lakes were clothed with cypress-like evergreens, and their shores were haunted by labyrinthodonts and various reptiles. The briny waters were unfavorable to life, and we have consequently few traces of any aquatic fauna, which seems to have consisted chiefly of small phyllopods (Estheria) and fishes. Eventually the lacustrine areas became largely silted up, and then subsidence of the land took place, so that the sea occupied some of the shallow depressions. In these marine tracts the Rhætic beds were deposited.

On the Continent during a large part of the Triassic period an inland sea extended W. from the Thüringerwald across the Vosges country into France, and stretched N. from the confines of Switzerland over what are now the low grounds of Holland and North Germany. In this ancient sea the Harz Mountains formed an island. In the earlier stages of the period the conditions resembled those that obtained in Great Britain, but the thick muschelkalk with its numerous marine forms seems to indicate an influx of water from the open sea. Afterward, however, this connection was closed, and the subsequent accumulations point to increasing salinity, during which chemical formations (gypsum, rock salt, etc.,) took place, while the marine fauna disappeared. Toward the close of the period, after the great inland lake had been largely silted up, a partial influx of the sea introduced a fauna comparable to that of the English Rhætic. It seems highly probable that the lands surrounding the inland lakes of Central and Northwestern Europe were more or less dry and sandy regions, like the great wastes of Central Asia. Many of the sandstones in the Bunter series of England are made up of grains so completely worn and rounded that they exactly recall the appearance presented by the wind-blown sands of desert regions. Some geologists therefore infer that in the earlier stages of the Triassic period large tracts of Great Britain were sandy deserts before the inland sea attained its greatest development. The Alpine Trias, which is mostly marine, shows that, while continental and lacustrine conditions obtained in Central and Northwestern Europe, an open sea existed towards the S.— a Mediterranean of much greater extent than the present. From the fact that Triassic rocks with characteristic fossils occur within the Arctic regions, it may be inferred that the climate of the period was generally genial or warm.

**Tribe,** an aggregate of stocks — a stock being an aggregate of persons considered to be kindred — or an aggregate of families, forming a community usually under the government of a chief. The chief is possessed of despotic power over the members of the tribe, which is one of the earliest forms of the community among all the races of men.

**Tribonianus,** a Roman jurist of the 6th century, of Macedonian parentage, but born in Paphlagonia. He held under the Emperor Justinian the offices of quæstor, master of the imperial household, and consul. He is famous chiefly through his labors in connection with the Code of Justinian, and the Pandects. He died in 545.

**Tribulus,** a genus of plants the species of which are known as caltrap, and of which about 35 species have been described.

**Tribune,** in Roman antiquities, properly the chief magistrate of a tribe. There were several kinds of officers in the Roman state that bore the title. (1) The plebeian tribunes, who were first created after the secession of the commonalty to the Mons Sacer (A. U. C. 260), as one of the conditions of its return to the city. They were especially the magistrates and protectors of the commonalty, and no patrician could be elected to the office. At their first appointment the power of the tribunes was very small, being confined to the assembling of the plebeians and the protection of any individual from patrician aggression; but their persons were sacred and inviolable, and this privilege consolidated their other powers, which, in the later ages of the republic, grew to an enormous height, and were finally incorporated with the functions of the other chief magistracies in the person of the emperor. The number of the tribunes varied from 2 to 10, and each of these might annul the proceedings of the rest by putting in his veto. (2) Military tribunes were first elected in the year A. U. C. 310, in the place of the consuls, in consequence of the demands of the commonalty to be admitted to a share of the supreme power. This measure was not, however, a complete concession of their demands, but, in fact, evaded them in a great degree; for the tribunate was not invested with the full powers or honors of the consulate, not being a curule magistracy, and, though it was open to all the people, patricians were almost invariably chosen. The number of the military tribunes was sometimes six and sometimes three. For above 70 years sometimes consuls were elected and sometimes military tribunes; at last the old order was permanently restored, but the plebeians were admitted to a share of it. (3) Legionary tribunes, or tribunes of the soldiers, were the chief officers of a legion, six in number, who commanded under the consul, each in his turn, usually about a month; in battle each led a cohort. Also, a bench or elevated place; a raised seat or stand. Specifically, the throne of a bishop, and a sort of pulpit or rostrum where a speaker stands to address an audience.

**Tricarpellites,** in palæobotany, a genus of fossil fruits. Capsule three-celled, three-valved, three-seeded, dehiscence septicidal. Seeds erect, compressed from back to face; hilum a little above the base of the seed. Placenta central, triangular, angles tumid near the base. Seven species have been described from the London Clay of Sheppey.

**Triceps,** in anatomy, a muscle, one extremity of which is composed of three distinct fasciæ. The triceps extensor cubiti occupies the whole brachial region; the fasciæ unite into a common mass, the tendon of which is inserted into the posterior and upper part of the olecranon, a bursa, however, intervening. Applied also to the triceps cruris extensor.

**Triceratium,** in botany, a genus of *Diatomaceæ*. Frustules free, valves triangular, areolar, each angle generally with a minute tooth or short horn. Kützing describes 14 species.

**Trichadenia,** in botany, a genus of *Pangiaceæ*, with a single species, *T. zeylanica*, the Tettigaha or Tettigass of Ceylon. It is diœcious, with alternate oblong leaves, and panicles of pale-green flowers. The fruits are about an inch in diameter, and contain one to three seeds, from which an oil is obtained useful for burning, and applied externally in the skin diseases of children.

**Trichalcite,** a hydrated arsenate of copper, found in radiated groups on tetrahedrite at the Turjinsk mine, Beresovsk, Urals; hardness, 2.5; luster, silky; color, verdigris-green. Composition: Arsenic acid, 38.73; phosphoric acid, 0.67; protoxide of copper, 44.19; water, 16.41 = 100, yielding the chemical formula $3CuOAsO_5 + 5HO$.

**Trichas,** in ornithology, the yellow-throat; a genus of *Parinæ*, with two species. Bill somewhat conic, compressed, the base a little widened, both mandibles equally thick; wings short, the first and second quills slightly graduated, tail rounded; feet large, slender; tarsus long, middle toe larger than the tarsus, lateral toes equal. *T. personatus* is the Maryland yellowthroat.

**Trichechidæ,** in zoölogy, a family of *Pinnipedia*, with a single genus, *Trichechus*. In many respects this family is intermediate between the *Otariidæ* and the *Phocidæ*, but the dentition is abnormal. The upper canines are developed into immense tusks, which descend a long distance below the under jaw; the other teeth, including the lower canines, are much alike, small, single, and with one root; the molars with flat crowns.

**Trichechus,** in zoölogy, the walrus; the sole genus of the family *Trichechidæ*, with one species, *T. rosmarus*, from the N. circumpolar regions. Some zoölogists consider the walrus of the North Atlantic to be distinct species from that found in the North Pacific, but they are more usually classed as varieties. Head round, eyes rather small, muzzle short and broad, with very long, stiff, bristly whiskers on each side; fur very short and adpressed; external ears absent; tail very rudimentary; toes sub-equal. On land the hind feet are turned forward and used in progression, though less completely than in the *Otariidæ*.

**Trichia,** in botany, a genus of *Myxogastres* or gasteromycetous *Fungi,* having a stalked or sessile, simple, membranous peridium bursting at the summit; spiral threads, which carry with them the spores. The threads and spores are often bright colored. Species numerous, occurring on rotten wood, etc.

**Trichasis,** in pathology, the growth of one or more of the eyelashes in a wrong direction, ultimately bringing it in contact with the anterior portion of the eyeball. Sometimes this is the natural mode of growth, but more frequently it is produced by a disease of the eyelid, or its inversion. The cure is slowly and steadily to remove each eyelash with a broad-pointed and well-grooved forceps, and then repeatedly apply spirits of wine to the place to destroy the follicles.

**Trichidium,** in botany, a tender, simple, or sometimes branched hair, which bears the spores of certain fungals, as in the genus *Geastrum.*

**Trichilia,** in botany, the typical genus of *Trichilieæ.* Trees or shrubs with unequally pinnate, rarely trifoliolate leaves; flowers in axillary panicles; calyx four or five cleft; petals four or five overlapping; stamens 8 or 10, united into a tube; fruit capsular, three-celled; seeds, two in each cell. Known species about 20, the majority from America, the remainder from Africa. The bark of *Trichilia emetica,* called by the Arabs roka and elcaija, is a violent purgative and emetic. The Arab women mix the fruits with the perfumes used for washing their hair; the seeds are made into an ointment with sesamum oil, and used as a remedy for the itch. *T. cathartica* is also a purgative. *T. moschata,* a Jamaica plant, has an odor of musk wood. *T. catigoa,* now *Moschoxylon catigoa,* the caatigua of Brazil, stains leather a bright yellow.

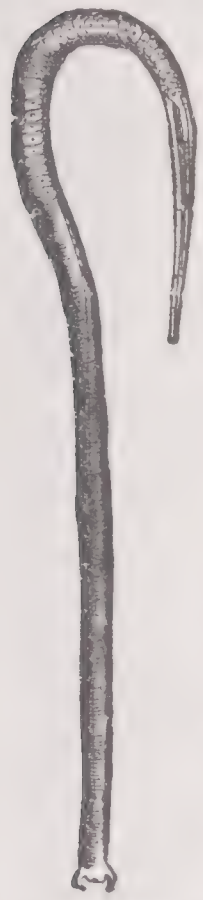
**Trichina,** in zoölogy, a genus of *Nematoidea,* established by Owen for the reception of the minute spiral flesh worm, *T. spiralis,* discovered in human muscle by Sir James Paget, in 1835, when a student at St. Bartholomew's Hospital, London. Mr. Hilton, of Guy's, had previously noticed gritty particles in human muscles, and recognized them as the results of parasites, afterward shown (by Owen) to be young trichinæ. The trichinæ met with in human muscle are minute immature worms, spirally coiled in small oval cysts, scarcely visible to the naked eye, measuring $\frac{1}{78}$ inch in length and $\frac{1}{13}$ inch in breadth. Sometimes the worms are not encysted, and measure $\frac{1}{25}$ inch in length and $\frac{1}{360}$ inch in breadth. The mature and reproductive trichinæ inhabit the intestinal canal of mammals, including man, and live for four or five weeks, attaining ability to reproduce on the second day of their introduction. The male is about $\frac{1}{18}$ and the female $\frac{1}{8}$ inch long. The eggs are hatched within the female, and as soon as the embryos are expelled they bore their way into the muscles, and there in about 14 days assume the form known as

TRICHINA SPIRALIS: MAGNIFIED.

*T. spiralis,* often setting up trichiniasis. Thus the only way in which trichinæ can get into the human system is by being swallowed alive with pieces of imperfectly-cooked muscle in which they are encysted. The pig is the great source of infection to man, as it is peculiarly liable to the presence of encysted trichinæ. Adult trichinæ do, or may, infest the intestinal canal of all animals in the muscles of which the larval forms have been found. These are, besides man, the pig, dog, cat, rabbit, rat, mouse, hedgehog, mole, and badger.

**Trichina Spiralis,** the name given to a peculiar nematoid worm which inhabits the muscles, usually of the pig. It was discovered in 1835; Mr. Wormald, then Demonstrator of Anatomy at St. Bartholemew's Hospital, London, giving to Professor Owen four microscopical specimens of speckled muscle from a subject that was then in the dissecting rooms; and Mr. Paget, then a first-year's student, simultaneously investigated the question. Professor Owen, to whom the discovery of the trichina is generally referred, soon afterward communicated to the Zoölogical Society his "Description of a Microscopic Entozoon Infesting the Muscles of the Human Body," in which he describes the speckles as capsules containing a spirally coiled microscopic worm, to which he gave the generic name trichina, and the specific name spiralis, from its coiled arrangement. The viviparous females, originally living in rats, begin about eight days after entering the intestines of their second host, a pig, to give birth to the larvæ, which pass into various parts of the

body, especially the muscles, where they coil up in a sack, or cyst, which eventually becomes calcareous and whitish. When pork thus infected is eaten the worms are set free in the stomach of their third host (man), and in three or four days there become sexually mature, each female being capable of producing 1,000 young.



TRICHINA SPIRALIS, MALE: MAGNIFIED.

**Trichiniasis,** a disease produced by the presence of trichinæ within the human system, and within the bodies of other animals liable to infestation. The first well-marked case occurred at Dresden in 1860, the patient being a servant girl, who was admitted to hospital, having taken ill on Jan. 12. The patient died after a short illness characterized by symptoms of lung inflammation, rheumatic pains, spasmodic contractions of the limbs, and other abnormal conditions, indicating some obscure lesion the nature of which was imperfectly understood. It was discovered at the post-mortem examination, that in the muscles of this patient numerous larval trichinæ were encysted, while mature trichinæ were found in the intestines. Previously to her illness the patient had assisted in making pork sausages, and had eaten some of the meat in a raw state, this fact accounting for the trichinose infestation. Zenker, who records the case, recognized in the symptoms those of a new lesion caused by the presence and development of trichinæ, within the tissues of man.

The preliminary symptoms are loss of appetite, prostration, and general debility, which continue for about a week. Pains of a rheumatic character, œdema, or dropsy and swelling of the limbs, along with fever, next occur, indicating the progress of the trichinæ brood from the digestive system to the muscles. This stage of trichiniasis is unquestionably the most dangerous. It is during the migration of the trichinæ from the alimentary canal, and as they force their way through to the muscular system, that the patient experiences the most severe symptoms and stands in greatest danger. Severe pains are experienced at this period in a typical case of trichiniasis, and even breathing may be executed with difficulty owing to the lesions of the muscles. Diarrhœa is also prevalent, the symptoms on the whole bearing a resemblance to those of gastric fever. In about four weeks after the commencement of the symptoms, the disease begins to abate. In severe cases the diarrhœa may continue, and often aids a fatal issue, arising from the prostration, together with the total derangement of the secretions. In an acute case of trichiniasis death has been known to occur as early as the fifth day of the disease, while a fatal issue has been allayed as late as the 42d day. Epidemics of trichiniasis have chiefly occurred on the Continent, where the habit of eating smoked and uncooked sausages is widespread. At Hattstadt, in October, 1863, an epidemic of this disorder affected 158 persons, a fatal result occurring in 28 cases.

An examination of pig's flesh shows that trichinæ are frequently found in the muscles. No external signs in the pig afford evidence of the presence of trichinæ, and the microscopic examination of the flesh is the only true test of infestation. A temperature of 167° F. is sufficient to kill trichinæ larvæ, and the prohibition against uncooked or imperfectly cooked animal food of all kinds, is to be rigorously insisted on in the rules of hygiene. The treatment of trichiniasis appears to consist in active purgation in the early stages of the disease, with the view of removing the worms from the intestine, calomel being the purgative usually given.

**Trichinopoli,** the chief town of the district of the same name, Madras presidency, British India; on the Cauvery river; 320 miles S. S. W. of Madras. It is celebrated for its fort, which was built (*circa* 1570) by a native prince of Madura, and formed the object of all the wars between the English and the French in Southern India between 1749 and 1763, when Clive first rose to fame. The fort occupies a granite cliff rising 500 feet above the plain, crowned with a small pagoda, with a cave temple hewn out of its S. face. The walls have recently been levelled, and the moat filled up, and the whole is now being laid out as a boulevard. Trichinopoli is the headquarters of the brigadier commanding the Southern Division of the Madras army. There are barracks for European troops and artillery. In the church is the tomb of Bishop Heber, who died here in 1826. The manufactures include jewelry, paintings on talc, paper and pith ornaments. Pop. (1901) 104,690. The district of Trichinopoli, which lies on both banks of the Cauvery, landward of Tranjore, has an area of 3,515 square miles. It abounds with gneiss, granite, iron ore and limestone. The products are rice, cotton, sugar, oil seeds, and tobacco. The exports include saltpeter, hewn stone for building, and grindstones. The imports are English piece goods. Besides the manufactures of the town, basket boats are made of wicker work covered with hides. This tract contains several *anicuts* or weirs, constructed across the river Cauvery, some by ancient

Hindu kings, and others by Sir Arthur Cotton (1836–1845). These irrigate 600,000 acres, and are considered the most successful works of their kind in India.

**Trichite,** in petrology, a name applied to certain microscopic capillary forms of uncertain nature, frequently met with in vitreous or semi-vitreous rocks. They occur curved or bent, and in aggregated groups.

**Trichites,** in palæontology, a sub-genus of *Pinna*, with five species, from the Oölite of England and France. Shell thick, inequivalve, somewhat irregular, margins wavy. Full-grown individuals are supposed to have measured a yard across; fragments an inch or more in thickness are common in the Cotteswold Hills.

**Trichiura,** in entomology, a genus of *Bombycidæ*, the male with pectinated, the female with ciliated antennæ. The abdomen slightly tufted, that of the male bifid; the wings in both sexes densely clothed with scales. *T. cratægi* is the pale oak eggar. It is gray, with a black band; is about an inch and a quarter across the expanded wings. The larva feeds on hawthorn, sloe, and sallow.

**Trichiuridæ,** in ichthyology, the single recent family of *Trichiuriformes*, with nine genera, from tropical and sub-tropical seas. Some of them are surface fishes, living in the vicinity of the coast, while others descend to moderate depths, but all are powerful and rapacious. The family is first represented in the Chalk of Lewes and Maestricht. *Hemithyrsites* and *Trichiurichthys*, allied to *Thyrsites* and *Trichiurus*, but covered with scales, are from the Miocene or Licata, where a species of *Lepidopus* also occurs.

**Trichiuriformes,** in ichthyology, a division of acanthopterygian fishes, with two families, *Trichiuridæ* and *Palæorhynchidæ*. Body elongate, compressed, or band-like; mouth-cleft wide, with strong teeth; spinous and soft portions of dorsal and anal of nearly equal extent, long, many-rayed, sometimes terminating in finlets; caudal forked, if present.

**Trichiurus,** in ichthyology, hair tails; the type genus of *Trichiuridæ*, with six species, belonging to the tropical marine fauna, but occasionally carried by currents to the north temperate zone. Body band-like, tapering to a fine point; dorsal extending whole length of the body, ventrals reduced to a pair of scales or entirely absent, anal rudimentary; long fangs in jaws, teeth on palatine bones.

**Trichocephalus,** in zoölogy, a genus of *Nematoidea*, comprising forms in which two-thirds of the body is filiform, terminating in a point. *T. dispar* affects man, and resides chiefly in the cæcum, but rarely causes serious mischief. It varies from an inch and a half to two inches in length; the male is smaller than the female, and has the tail spirally contorted. *T. affinis*, a closely allied species, infesting some of the lower animals, has been known to produce serious irritation of the intestines.

**Trichocysts,** in biology, the name given to microscopic vesicular bodies in the internal lamina of the cortical layer in certain of the Infusoria. They are capable of emitting thread-like filaments, probably for offensive and defensive purposes, and in many respects they closely resemble the thread cells of the *Cœlenterata*.

**Trichoda,** in zoölogy, a genus of *Ophryoglenidæ*; an ovate furrow leading to the mouth, with a vibratile flap on its inner wall. Common in putrid infusions.

**Trichodectes,** in entomology, a genus of *Mallophaga*, family *Philopteridæ*. Known species 10, parasitic on the dog, the fox, the cat, the weasel, the ox, the sheep, deer, and the horse. *T. latus* is common on puppies.

**Trichoderma,** in botany, the typical genus of *Trichodermaceæ*. Peridium roundish, composed of interwoven ramified, septate filaments; spores minute, conglobated, then heaped together. *T. viride* grows on fallen trees.

**Trichodesma,** in botany, a genus of *Cynoglosseæ*. Corolla sub-rotate, with the throat naked; anthers exserted, with pointed awns made to adhere together by means of hairs. Plants from India, Egypt, and South Africa. An infusion of the leaves of *T. indicum* is given in snake bites, and is considered a diuretic, a blood purifier, and a cooling medicine. This and *T. zeylanicum* are used externally as emollient poultices. The leaves of *T. africanum*, which grows in the Punjab and Scinde, as well as in Africa, are diuretic.

**Trichodesmium,** in botany, sea dust, a genus of *Oscillatoridæ;* microscopic algæ, the short threads of which are collected in little fascicles which float and form a scum upon the surface of the sea. Ehrenberg and Dupont found that they produced the red color over large tracts in the Red Sea. Darwin and Hinds found them in the Atlantic and Pacific Oceans, and they have also been observed in the Chinese Sea. Ehrenberg recognizes two species, *T. ehrenbergii*, and *T. hindsii*. Both, when young, are blood-red, though the first becomes green when old. Notwithstanding this, they may not be specifically distinct.

**Trichodina,** in zoölogy, a genus of *Urceolariidæ*, with five species from salt and fresh water; all parasitic. Animalcules free-swimming, elastic, changeable in shape; oral aperture terminal, posterior extremity discoidal, but ciliated; contractile vesicle spherical, near termination of pharynx.

**Trichogastres,** in botany, a sub-order of *Gasteromycetes.* The leathery peridium breaks when mature, emitting a pulverulent mass of spores and filaments, without a central column. It contains the puff balls and one or two species of esculent fungi.

**Trichoglossidæ,** in ornithology, in Reichenow's classification, a family of *Psittaci.* Wallace also considers the group to form a family, and makes it consist of six genera, with 50 species. These birds are exclusively confined to the Australian region.

**Trichoglossinæ,** in ornithology, brush-tongued parrots; a sub-family of *Psittacidæ.* This group differs greatly in its extent in various classifications. Their plumage is very beautifully colored, and they are mostly found in Australia, and the Moluccas, some few species extending through the islands of the Pacific.

**Trichoglossus,** in ornithology, the type genus of *Trichoglossidæ* or *Trichoglossinæ,* with 29 species, ranging over the whole of the Austro-Malay and Australian sub-regions, and to the Society Islands. They have an extensile brush-tipped tongue, adapted to extract the nectar and pollen from flowers.

**Trichomanes,** in botany, the bristle fern; a genus of *Hymenophylleæ.* Sori marginal, axile, or terminal; capsules upon an elongated receptacle within a cylindrical or suburceolate one-leaved involucre of the same texture as the frond, and opening above; veins forked. Known species 78, chiefly from warm countries. One, *T. radicans,* is the rooting bristle fern. The rootstock is creeping; the frond, which is from 5 to 12 inches long, is twice or thrice pinnatifid. Found in Wales and in Ireland, near Killarney and Wicklow, but is rare.

**Trichomonas,** in zoölogy, a genus of *Trimastigidæ;* endoparasitic animalcules, free-swimming, soft and plastic, ovate or subfusiform, bearing at the anterior extremity two long sub-equal flagella a supplementary flagellum depending from the posterior extremity. There are three species: *T. batrachorum,* from the intestinal canal of the common frog and toad; *T. limacis,* from the intestinal canal of *Limax agrestis,* the gray slug; and *T. vaginalis,* discovered by Dujardin in human vaginal mucus.

**Trychomycterus,** in ichthyology, a genus of *Siluridæ,* sub-family *Opisthopteræ.* They are small South American fishes, and many of the species are found at altitudes up to 14,000 feet above the sea-level.

**Trichonema,** in botany, a genus of *Iridaceæ.* Leaves radical, slender; perianth, single, petaloid, deeply cleft into six segments, the tube shorter than the limb. Stamens three, filaments hairy; stigmas three, slender, bipartite; capsule ovoid, three-lobed; seeds globose. Known species 21, chiefly from Southern Europe. *T. edule* is eaten by the natives of Socotra. In zoölogy, the type genus of *Trichonemidæ.* Animalcules more or less ovate, elastic, and changeable in form; oral aperture distinct, at the base of the flagellum. There is one species.

**Trichonemidæ,** in zoölogy, a family of cilio-flagellate Infusoria. Animalcules free-swimming, with a single terminal flagellum, the remainder of the cuticular surface more or less completely clothed with cilia. There are two genera, *Trichonema* and *Mitophora.*

**Trichonotidæ,** in ichthyology, a family of acanthopterygian fishes, division Blenniiformes. They are small carnivorous fishes, of which only two species are known, each constituting a genus; *T. setigerus,* from the Indian Ocean, having some of the anterior dorsal rays prolonged into filaments, and *Hemerocœtes acanthrohynchus,* from New Zealand, sometimes found far out at sea on the surface.

**Trichonympha,** in zoölogy, the type gegus of *Trichonymphidæ.* Animalcules exceedingly flexible and elastic, often convolute, mostly separable into two distinct regions, consisting of a smaller ovate head-like portion and a larger more or less inflated body. There is one species, *T. agilis,* endoparasitic within the intestines of white ants.

**Trichonymphidæ,** in zoölogy, a family of holotrichous *Infusoria,* with three genera: *Trichonympha, Pyrsonema,* and *Dinenympha.* Animalcules freely motile, but rarely swimming, their movements being confined to twisting and writhing motions; cuticular surface ciliate, accompanied, apparently, in some instances, by an undulating membrane. Occurring as endoparasites in certain neuropterous insects.

**Trichophrya,** in zoölogy, a genus of suctorial *Tentaculifera.* Animalcules without a lorica, ovate or elongate, temporarily affixed in a sessile manner to various objects without the medium of a pedicle; tentacles suctorial, variously distributed. There are two species: *T. epistylidis,* living on fresh-water plants, and *T. digitata,* parasitic on fresh-water *Entomostraca.*

**Trichophyton,** a minute fungus growth which attackes the follicles of the hair and gives rise to the disagreeable and often serious disease known as tinea barbæ, or barber's itch. It is easily introduced through slight cuts or abrasions on the face or neck, under the skin, and produces in-

flammation at the roots of the hair. It is highly contagious and poisonous, and spreads with great rapidity. In some severe cases it leads to blood poisoning. These fungi colonize in large numbers in the brushes and combs used in barber shops, as shown in a tour of inspection of the latter made by the Board of Health of New York city. Ten per cent of all cases of skin diseases are various forms of this tinea barbae, or diseases that claim it as a starting point for more serious things. The only preventive for this evil is to make it compulsory to cleanse thoroughly the towels, brushes and other instruments used by barbers, subjecting everything to a daily antiseptic bath.

**Trichoptera,** in entomology, caddis flies; a group or sub-order of *Neuroptera,* with close affinity to the *Lepidoptera,* through some of the lower forms of that order. They are grouped in two divisions: (1) Inæquipalpia, with three families, *Phryganeidæ, Limnophilidæ* and *Seriscostomidæ;* (2) Æquipalpia, with four families, *Leptoceridæ, Hydropsychidæ, Rhyacophilidæ,* and *Hydrophilidæ.* They are for the most part moth-like insects, having a smallish head, with the mouth downward, and usually three ocelli at the vertex; antennæ bristle-shaped, generally long, the first joint thicker than the rest, and more or less hemispherical; hind wings wider, shorter, and more rounded than the anterior, neuration comparatively simple, surface of wings generally clothed with hairs, which sometimes simulate scales. In the males of a few species the hinder wings are rudimentary, and in one genus, *Enoicyla,* the females are almost destitute of wings. Coxæ large and conical, meeting in the middle line of the body; tibiæ spurred at the apex, and generally also in the middle. The larvæ have well-developed thoracic legs and anal hooks, but no pro-legs; they live in tubes composed of various materials by different species; the pupa lies free in the case, or sometimes in a special cocoon, and is only active just before its metamorphosis.

**Trichostomei,** in botany, a tribe of mosses, peristome with 30 filiform teeth, often arranged in pairs, and sometimes twisted. Found in Europe, often in high latitudes.

**Trichothalamus,** in botany, a section of the genus *Potentilla.* Shrubby species. Petals five, orbicular, yellow; achenes many, hairy, on a very hispid receptacle.

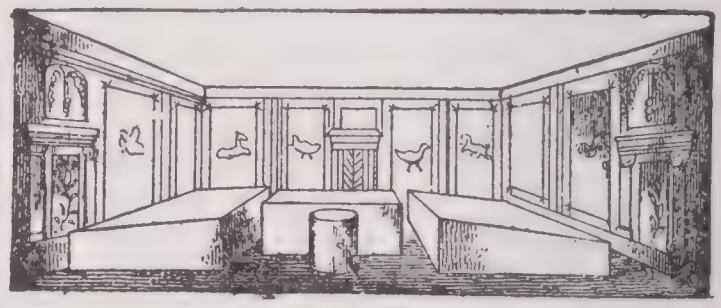
**Trichotoropis,** in zoölogy, a genus of *Muricidæ,* with 14 recent species, widely distributed in Arctic and boreal seas. Shell thin, umbilicated, spirally furrowed; the ridges with epidermal fringes; columella obliquely truncated; operculum lamellar; animal with short, broad head, tentacles distant, eyes in the middle; proboscis long, retractile.

**Trichroism,** in crystallography, the property possessed by some crystals of exhibiting different colors in three different directions when viewed by transmitted light.

**Trichys,** in zoölogy, a genus of *Hystricinæ,* with one species, *T. lipura,* from Borneo. It resembles Atherura externally, but differs in many cranial characters.

**Trickett, William,** an American lawyer; born in England, in 1840; was graduated at Dickinson College in 1868 and was admitted to the bar in 1876. He was made dean of Dickinson School of Law in 1890; was candidate for the Superior Court of Pennsylvania on the Democratic ticket in 1898. He was the author of "Law of Liens in Pennsylvania" (3 vols. 1882); "Law of Limitations in Pennsylvania" (1884); "Law of Assignments in Pennsylvania" (1884); "Law of Boroughs in Pennsylvania" (2 vols. 1893 and 1898); "Law of Streets and Roads in Pennsylvania" (1894); "Law of Guardians in Pennsylvania" (1900); and "Law of Partitior in Pennsylvania' '(1900).

**Triclinium,** in Roman antiquities, in early times, the whole family sat together in the atrium, or public room; but when man-



ROMAN TRICLINIUM, OR BANQUET HALL.

sions were built upon a large scale, one or more spacious banqueting halls commonly formed part of the plan, such apartments being classed under the general title of triclinia. The word triclinium, however, in its strict signification, denotes not the apartment, but a set of low divans or couches grouped round a table; these couches, according to the usual arrangement, being three in number, and arranged round three sides of the table, the fourth side being left open for the ingress and egress of the attendants, to set down and remove the dishes. Each couch was calculated to hold three persons, though four might be squeezed in. Men always reclined at table, resting on the left elbow, their bodies slightly elevated by cushions, and their limbs stretched out at full length.

**Tricolor,** a flag or banner having three colors; specifically, a flag having three colors arranged in equal stripes or masses. The present European tricolor designs are,

for Belgium, black, yellow, red, divided vertically; France, blue, white, red, divided vertically; Holland, red, white, blue, divided horizontally; Italy, green, white, red, divided vertically. During the revolution of 1789 in France, the revolutionists adopted as their colors the three colors of the city of Paris for their symbol. The three colors were first devised by Mary Stuart, wife of Francis II. The white represented the royal house of France; the blue, Scotland; and the red, Switzerland, in compliment to the Swiss guards, whose livery it was. In botany, *Amaranthus tricolor*, a species from China, with bright foliage, but insignificant flowers.

**Triconodon,** in palæontology, the name proposed for "a small zoöphagous mammal, whose generic distinction is shown by the shape of the crowns of the molar teeth of the lower jaw, which consist of three nearly equal cones on the same longitudinal row, the middle one being very little larger than the front and hind cone." The animal was marsupial, and the remains are from the Purbeck dirt bed.

**Tricorporal,** or **Tricorporate,** in heraldry, a term applied when the bodies of three beasts are represented issuing from the dexter, sinister, and base points of the escutcheon, and meeting, conjoined to one head in the center point.

TRICORPORAL.

**Tricoupis, Spiridion,** a Greek statesman; born in Missolonghi, April 20, 1788. He served as private secretary to Lord Guilford in the Ionian Isles, but took his place among the patriots on the outbreak of the war of independence. From 1821, except during the presidency of Capo d'Istria, he was continually employed in administrative and diplomatic business; was thrice sent to London as envoy extraordinary; was minister of foreign affairs and of public instruction (1843); vice-president of the senate (1844–1849); and envoy extraordinary to Paris (1850). He died Feb. 24, 1873. His speeches were collected in Paris (1836). Notable also are his poem on the Klephts (1821), and his "History of the Greek Revolution" (1853–1857).

**Tricycle,** a three-wheeled machine for traveling on the road. It is an improvement on the old velocipede, and was introduced in its present form about 1878. The earliest patterns were rear steering, but were soon superseded by front-steering machines, the latter being steadier, and having better hill-climbing qualities. Tricycles were first worked by levers carrying pedals, which were connected by chains to a cranked axle. This form of machine was very powerful, but tiring to the knees, and speedily gave way to the rotary action, which consists of a cranked axle, the pedals being fastened on it. This axle has also a toothed wheel, sometimes placed in the center and then called central-geared, sometimes at the end. This wheel in most machines catches in each link of a chain, and the chain runs over a corresponding toothed wheel fixed on the axle of the driving wheel; in other machines a wheel which catches the teeth of the two wheels is inserted between them. The positions and sizes of the wheels vary in nearly every make, as does the mode of steering.

**Tridacna,** in zoölogy, the giant clam; the sole genus of the family *Tridachidæ*, with seven species, from the Indian Ocean, China Seas, and the Pacific. Shell massive, extremely hard, calcified till almost every trace of organic structure is obliterated; trigonal, ornamented with radiating ribs and imbricating foliations, margins deeply indented; byssal sinus in each valve, large, close to the umbo in front; hinge teeth 1-1. This genus attains a greater size than any other bivalve. *T. gigas*, from the Indian Ocean, the shell of which often weighs 500 pounds, contains an animal weighing about 20 pounds, which, according to Captain Cook, is very good eating. Darwin says of this species: "We stayed a long time in the lagoon, examining . . . the gigantic clam shells, into which if a man were to put his hand, he would not as long as the animal lived be able to withdraw it." The Paphian Venus, springing from the sea, is usually represented as issuing from the opening valves of a *Tridacna*. The natives of the Eastern Archipelago often use the valves as bathing tubs. Two, measuring about two feet across, are used as holy-water stoups in the Church of St. Sulpice in Paris.

**Tridacnidæ,** in zoölogy, a family of conchiferous mollusks, group integro-palliata. Shell regular, equivalve, truncated in front; ligament external; sometimes the animal is attached by a byssus, at others it is free. One genus *Tridacna* with a sub-genus *Hippopus*.

**Tridecyl Hydride,** $C_{13}H_{28} = C_{13}H_{27}H$; hydride of cocinyl; a hydrocarbon of the marsh-gas series, occurring in American petroleum. It boils at 218°, has the odor of turpentine, and burns with a smoky flame.

**Trident,** a three-pronged fork used by fishermen; is employed as the attribute of Poseidon (Neptune); and is frequent on coins of such Greek States as had Poseidon for patron deity. The conventional figure of Britannia bears a trident as the symbol of sovereignty over the sea.

**Tridentine Creed,** in Church history, the profession of the Tridentine faith, pub-

lished by Pope Pius IV., in 1564. It originally consisted of the Nicene creed, with a summary of the Tridentine definitions, to which is now added a profession of belief in the decrees of the Vatican Council.

**Tridymite,** in mineralogy, a triclinic form of silica, presenting a pseudo-hexagonal aspect through the twining of three individuals. It occurs in small hexagonal tables, sometimes in groups, in cavities of trachytic rocks. First found at Cerro St. Cristoval, near Pachuca, Mexico; now known as a frequent constituent of trachytes from many localities.

**Trientalis,** in botany chickweed, wintergreen, a genus of *Primuleæ,* or *Primulidæ.* Slender, low, smooth perennials; a rootstock slender, creeping. Leaves elliptical, in a single whorl of five or six; flowers, solitary, white; calyx five to nine partite, the most common division being into seven segments; corolla rotate, with a short tube and as many divisions as the calyx; stamens beardless, five to nine, often seven; style simple, filiform; stigma obtuse; fruit capsular, globose, bursting transversely, many-seeded. Known species, six or eight; from Europe, Northern Africa, Temperate Asia, and North and South America. *T. americana,* which may be distinguished from the European species by possessing narrow lanceolate, acuminate (in place of elliptical) leaves, and acuminate petals, is found in mountainous districts in Canada, Virginia, etc.

**Trieste,** the most important seaport of Austria-Hungary, and most considerable trading town on the Adriatic; at the head of the Gulf of Trieste, an arm of the Gulf of Venice; 370 miles S. S. W. of Vienna. In 1849 it was constituted an imperial free city, and attached and belonging to it is a territory 36 square miles in extent. The city of Trieste, in which the population of the district is almost wholly amassed, consists of the old town, the new town, or Theresienstadt, and two suburbs, Josefstadt and Franzenstadt. The old town, built on the slope of a steep hill, crowned by a castle (1508–1680), is distinguished by its narrow streets and black walls. It contains the cathedral, a Byzantine edifice built between the 5th and 14th centuries, into the walls of which stones bearing Roman inscriptions and carving have been built, and the tower of which is said to rest on the foundation of a temple of Jupiter. The new town, with broad streets built in regular parallelograms and handsome houses, occupies the plain that fronts the sea. Between these two divisions runs the Corso, the chief thoroughfare. The Tergesteo (1840), in the new town, is a splendid modern edifice, containing an exchange and reading rooms, and the offices of the Austrian Lloyd's. Trieste, which from 1719 till July 1, 1891, was a free port, has a very fine new harbor (1868–1883). The manufactures are very extensive, including shipbuilding, rope making, and the manufacture of soap, rosoglio, white lead, leather, etc. A great agricultural exhibition was held at Trieste in 1882. Pop. (1909) 221,993, nearly all Catholics, and mostly Italian-speaking.

Trieste, the ancient Tergeste or Tergestum, was of importance under the Romans, and first receives historical mention 51 B. C., when it was overrun and plundered by neighboring tribes. In 1382 it passed finally into the hands of Austria. It owes its prosperity chiefly to the Emperor Charles VI., who constituted it a free port, and to Maria Theresa. Since 1816 Trieste has borne the title of the "Most Loyal of Towns." Charles Lever and Sir Richard Burton were consuls here.

**Triethyl Glycerin,** formula, $C_9H_{20}O_3 = \frac{(C_2H_5)_3}{(C_3H_5)'''}\Big\}O_3$; triethylin; a liquid possessing a pleasant ethereal odor, obtained by heating to 100° a mixture of acrolein, alcohol, and acetic acid. It is miscible with water, has a sp. gr. .8955 at 15°, and boils at 186°.

**Trifacial Nerves,** in anatomy, the fifth pair of nerves, which arise at the junction of the medullary processes of the cerebellum to enter the dura mater near the point of the petrous processes of the temporal bones. There they leave the skull in three great branches (whence their name) — the first, highest, or ophthalmic trunk to enter the orbit, the second or upper maxillary nerve to the face below the orbit; and the third, or lower maxillary nerve, to be distributed to the external ear, the tongue, the lower teeth, and the muscles of mastication. Called also trigemini or trigeminal nerves.

**Trifolium,** trefoil; clover; the typical genus of *Trifolieæ.* Low herbs, with the leaves, as a rule, digitately trifoliate; flowers capitate, spiked, rarely solitary, with red, purple, white, or yellow flowers; calyx five-toothed, the teeth unequal; wings united by their claws to the obtuse keel, persistent; legume about as long as the calyx, one to four-seeded, indehiscent. Species about 150, chiefly from the Northern Hemisphere.

**Triforium,** in architecture, a gallery or arcade in the wall over the pier arches which separate the body from the aisles of a church. The arcade is not in general carried entirely through the wall, but there is commonly a passageway behind it which is often continued in the thickness of the wall round the entire building; in some cases, however, the arcade is entirely open, as at Lincoln Cathedral. Sometimes the triforium is a complete upper story

over the side aisle, having a range of windows in the side wall, as at Ely, Norwich, Gloucester choir, Peterborough, Lincoln choir, Westminster Abbey, etc. In some continental churches of Decorated and later work, the aisle roofs are kept entirely below the level of the triforium, and the back of it is pierced with a series of small windows, corresponding with the ornamental work in the front, thus forming what is sometimes called a transparent triforium.

**Triforis,** in zoölogy, a sub-genus of *Cerithium*, with 30 recent species; ranging from Norway to Australia. Shell sinistral; anterior and posterior canals tubular; the third canal accidentally present, forming part of a varix. Fossil in the Eocene of Great Britain and France.

**Trigenic Acid,** $C_4H_7N_3O_2 = (CN)_2O \cdot C_2H_3(NH_4)O$; an acid containing the elements of cyanic anhydride and aldehyde ammonia, obtained by passing the vapor of cyanic acid over aldehyde. It crystallizes in small prisms, slightly soluble in water, insoluble in alcohol. When slightly heated it melts and carbonizes, giving off alkaline vapors having the odor of chinoline.

**Trigger Fish,** in ichthyology, a popular name for the genus *Balistes*, from the fact that when the dorsal fin is erected, the first ray, which is very thick and strong, holds its elevated position so firmly that it cannot be pressed down by any degree of force; but if the second ray be depressed, the first immediately falls down like the hammer of a gun when the trigger is pulled.

**Triggs, Oscar Lovell,** an American author; born in Greenwood, Ill., Oct. 2, 1865; was graduated at the University of Minnesota in 1889, and then studied in the Universities of Oxford and Berlin. In 1892 he became connected with the English Department of the University of Chicago. He was the author of "Browning and Whitman: a Study in Democracy" (1893); "The Changing Order" (1901); and many review articles. He also edited Lydgate's "Assembly of Gods" (1895); and "Selections from Prose and Poetry of Walter Whitman" (1898).

**Trigla,** in ichthyology, a genus of *Cottidæ*, with about 40 species, from tropical and temperate zones. Head parallelopiped, with the upper surface and sides entirely bony, the enlarged infraorbital covering the cheek; two dorsal fins; three free pectoral rays, serving as organs of locomotion as well as of touch; teeth villiform. Doctor Günther refers the species to three groups: (1) Trigla, no palatal teeth, scales, except those of lateral line, exceedingly small; (2) Lepidotrigla, no palatal teeth, scales of moderate size; (3) Prionotus, with palatal teeth. They are generally used as food, and seven species occur on American and European coasts. *T. pini* (red gurnard), *T. lineata* (streaked gurnard), *T. hirundo* (sapphirine gurnard), *T. gurnardus* (gray gurnard), *T. cuculus* (Bloch's gurnard), *T. lyra* (the piper), and *T. obscura*, or *lucerna* (the long-finned gurnard). Some of the species, by the vibration of the muscles of the swim bladder, produce long-drawn sounds, which range over nearly an octave. Two or three species are known, from the Tertiary.

**Triglochin,** in botany, arrow grass; a genus formerly called *Juncago*, typical of the order *Juncaginaceæ*. Saline plants; root fibrous, leaves very narrow; flowers in a naked, straight spike or a raceme; perianth of six erect, concave, deciduous leaves; stamens six, anthers nearly sessile, stigmas three to six, sessile, plumose; capsules three to six, one-seeded, united by a longitudinal receptacle; albumen none. Known species about 10, from the temperate zone regions, Australia being a favorite habitat. Two familiar species are *T. palustre*, the marsh, and *T. maritimum*, the seaside arrow grass. The first has a three-celled, nearly linear, the latter a five-celled, ovate fruit. The first occurs in marshy meadows, by riversides, and in ditches; the latter in salt marshes.

**Triglyph,** in the plural, in architecture, ornaments repeated at equal intervals in the Doric frieze. Each triglyph consists of two entire gutters or channels cut to a right angle, called glyphs, and separated by their interstices, called femora, from each other, as well as from two other half-channels that are formed at the sides.

**Trigona,** in entomology, a genus of social bees; small *Apidæ* forming their nests within hollow trees or the cavities of rocks in America, Sumatra, Java, etc. In zoölogy, a genus of *Veneridæ*, with 28 recent species, from the West Indies, Mediterranean, Senegal, Cape India, and the W. coast of America. Shell trigonal, wedge-shaped, sub-equilateral; ligament short, prominent; hinge-teeth 3–4; pallial sinus rounded, horizontal. Found fossil in the Miocene of Bordeaux.

**Trigonella,** in botany, *Fenugreek*, a genus of *Trifolieæ*. Leaves trifoliolate; calyx five-toothed, the teeth nearly equal; petals distinct, keel obtuse; flowers in few or many-flowered heads, or in short racemes. Legume straight or slightly curved, two-valved, much longer than the calyx. Known species 50, all from the Eastern Hemisphere. One, *Trigonella ornithopodioides*, the bird's-foot fenugreek, is British. It has decumbent stems, two to five inches long, obcordate leaflets, toothed at the end, the peduncles bearing about three flowers; the legumes nearly twice the length of the

calyx, and containing about eight seeds. Found in dry, sandy pastures, generally near the sea. It flowers in July and August. A decoction of it is used as an emollient, and its flowers are made into poultices for veterinary use. *T. fœnum grœcum*, the fenugreek, or fenugræc, is an erect annual, one or two feet high, a native of the Mediterranean region and of the Punjab. It is cultivated in India and other warm countries, and occasionally in England, where, however, the climate is too variable to render it a profitable crop. In India the seeds are largely used as a condiment and as a substitute for coffee; they also yield a yellow dye. Containing the principal coumarin, which imparts the pleasant sweet smell to hay, they are used to render damaged hay palatable to horses, and are an ingredient in concentrated cattle food.

**Trigonellites,** in palæontology, the name given by Parkinson in 1811 to the opercula of certain species of ammonites. These opercula are divided into two symmetrical pieces by a straight median suture, and were mistaken for bivalve shells.

**Trigonia,** in botany, the single genus of the order *Trigoniaceæ*; tropical American trees with opposite, stipulate leaves, their inflorescence in panicles, irregular flowers, and long, hairy seeds. In zoölogy, the sole recent genus of *Trigoniadæ*, with three species (or varieties) from Australia. Shell almost entirely nacreous, thick, tuberculated, or ornamented with radiating or concentric ribs; posterior side angular; ligament small and prominent; hinge teeth 2–3, diverging. Animal with a long, pointed foot, bent sharply, heel prominent; gills ample, the outer smaller than the inner, united behind the body to each other and to the mantle. The species are very active. They are probably migratory, as in dredging for them it is very uncertain where they may be obtained. A hundred fossil species are known, widely distributed in space, and ranging in time from the Lias to the Chalk, but almost, if not entirely absent from the Tertiary. The shell is wanting or metamorphic in limestone strata.

**Trigoniaceæ,** in botany, Von Maritus' name for an order which he separates from *Polygalaceæ* on account of its opposite leaves, the possession of stipules, etc.

**Trigoniadæ,** or **Trigonidæ,** in zoölogy, a family of conchiferous mollusks, group Integro-pallialia. Shell equivalve, close, trigonal, umbones directed posteriorly; ligament external, interior nacreous; hinge teeth few, diverging; pallial line simple. Animal with the mantle open; foot long and bent; gills two on each side, recumbent; palpi simple. Five fossil genera are known, ranging from the Lower Silurian to the Trias.

**Trigonocarpon,** a genus of fossil plants founded on three or six angled nut-like fruits, commencing in the Devonian and abundant in the Carboniferous rocks. The exterior of the fruit was probably fleshy. It was once believed to be a palm fruit; then Sir Joseph Hooker considered it the solitary fruit of the recent *Salisburia*, a taxad, though Principal Dawson believes it to have been *Sigillarioid.*

**Trigonocephalus,** in zoölogy, a genus of *Crotalidæ*, with three species, ranging from Mexico to Patagonia. Body elongate fusiform, back slightly compressed; head large and distinct from neck, depressed, triangular; muzzle prominent, angular; tail short, tapering to a point; crown shields small, scale-like; eye moderate; pupils vertical; scales keeled.

**Trigonometrical Lines,** lines which are employed in solving the different cases of plane and spherical trigonometry, as radius, sines, cosines, tangents, cotangents, secants, cosecants, etc. These lines, or the lengths of them, are called the trigonometrical functions of the arcs to which they belong. When an arc increases through all its values from 0° to 360°, the sines and cosecants are positive in the first and second quadrants, and negative in the third and fourth; the tangents and cotangents are positive in the first and third quadrants, and negative in the second and fourth; the cosines and secants are positive in the first and fourth quadrants, and negative in the second and third, and the versed sines and coversed sines are positive throughout.

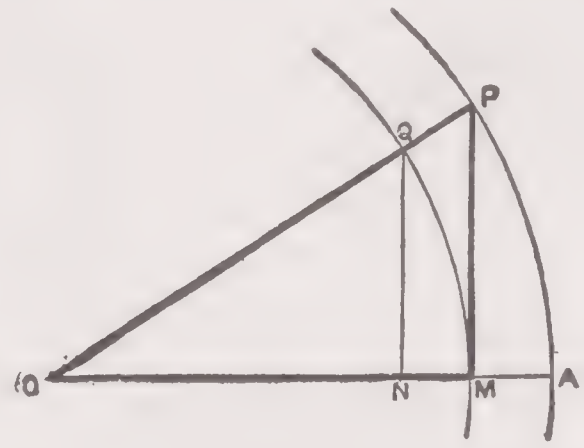
**Trigonometrical Survey,** a survey of a country carried out from a single base by the computation of observed angular distances; but the term is usually confined to measurements on a large scale embracing a considerable extent of country and requiring a combination of astronomical and geodetical operations. A trigonometrical survey may be undertaken either to ascertain the exact situation of the different points of a country relatively to each other and to the equator and meridians of the terrestrial globe, for the purpose of constructing an accurate map, or to determine the dimensions and form of the earth by ascertaining the curvature of a given portion of its surface, or by measuring an arc of the meridian. The most minute accuracy and the most perfect instruments are required in all the practical parts of such operations, and regard must be had to the curvature of the earth's surface, the effects of temperature, refraction, altitude above the level of the sea, and a multitude of other circumstances which are not taken into account in ordinary surveying. In a trigonometrical survey the whole area to be surveyed is divided into a system of triangles, commencing from a carefully meas-

Trigonometry

ured base, which forms the side of the first triangle. These are further intersected by a network of smaller triangulations, which will fix all the secondary points on the surface, and finally the details of the ground are completed by measurement and the theodolite.

The value of this work of triangulation lies in the exactitude of the base line and the determination of the true position of the starting point at one of its extremities. Extreme care is measurement and a most painstaking repetition of observations are essential; for errors committed at this period of a survey are not merely continued, but increased, as the work proceeds. Having completed the determination of the base line, the more prominent or most central and convenient points are fixed for the greater triangulation. Powerful theodolites are used for this purpose, and great care is taken that the triangles are as nearly equilateral as possible, so as to avoid the inaccuracy which taking very acute angles would induce. The triangulation proceeds from the base line in a series of gradually increasing triangles, and these are repeatedly taken, their means carefully calculated, and their reduction to the true surface completed by mathematical calculation. When the greater triangulation is completed, the minor points, those of less importance, are united by a series of smaller triangles, till the relative positions of all the prominent natural and artificial features of the area (the whole of which, with the exception of the base line, have been fixed by mathematically corrected trigonometrical calculation), can be finally marked down on the map. The remainder of the work is done by absolute measurement with a chain, a small theodolite being still used for correction and to determine the bearings of the points with regard to those of the greater triangles.

**Trigonometry,** originally the branch of geometry which had to do with the measurement of plain triangles. This gradually resolved itself into the investigation of the relations between the angles of the triangle, for the simple reason that all triangles having the same set of angles are similar, so that if, in addition, one side is given the other two at once follow. It is easy to show from the Sixth Book of Euclid that, it we fix the values of the angles of a triangle, the ratio of the sides containing any one of these angles is the same whatever be the size of the triangle. This ratio is a definite function of the angles; and it is with the properties of such ratios that trigonometry has now to deal. The fundamental ratios are obtained from a right-angled triangle, of which one angle is the angle under consideration. It will suffice to show what these ratios are and how they have received their names. Let POM be the angle considered, PM being drawn perpendicular to OM. With center O describe the two circles PA and MQ. The appropriate measure of the angle at O is the ratio of the subtended arc to the radius — *i. e.*, either $\widehat{AP}/OP$ or $\widehat{MQ}/OM$ (see CIRCLE). This measure we shall adopt throughout, and shall represent it by the symbol $\theta$. If QN is drawn perpendicular to OM, then the ratio of any pair of sides of the triangle




OQN is equal to the ratio of the corresponding sides of triangle OPM. All the possible ratios which can be formed are the so-called trigonometrical or circular functions of the angle $\theta$. Thus the ratio PM/OP or QN/OQ is the sine of $\theta$. It is evidently half the chord of the angle $2\theta$; and its value is numerically less than 0, because PM being less than the chord PA is less than the arc PA. Again, the ratio PM/OM is the tangent of $\theta$. MP is, in fact, the geometrical tangent drawn from the one extremity of the arc MQ till it meets the radius through the other extremity. For a similar reason the ratio OP/OM or OQ/ON is called the secant of the angle $\theta$. In the same way the ratios OM/OP, OM/PM, OP/PM are respectively the sine, tangent, and secant of the angle OPM, which is the complement of the angle POM. Hence these ratios, regarded as functions of $\theta$, are called the cosine, cotangent, and cosecant of $\theta$. For any given angle there are, then, six trigonometrical functions. It is obvious that these functions are mutually dependent. Indeed, if any one is given the other five can be at once calculated. For instance, the well-known relation $OM^2 + MP^2 = OP^2$ gives at once by dividing by $OP^2$

$$(\sin.\ \theta)^2 + (\cos.\ \theta)^2 = 1,$$

or, as it is usually written,

$$\sin.^2\ \theta + \cos.^2\ \theta = 1.$$

Then, again, the cosecant is the reciprocal of the sine, and the secant of the cosine. The tangent is the ratio of the sine to the cosine; and the cotangent is the reciprocal of the tangent. The sine and cosine are never greater than unity, and the secant and cosecant are never less than unity. The

tangent is less or greater than unity according as the angle POM is less or greater than half a right angle.

Suppose OP to rotate counter-clockwise. Then as the angle AOP increases from zero to a right angle the sine evidently grows from zero to unity; while at the same time the cosine diminishes from unity to zero. Continuing the increase so that AOP becomes an obtuse angle, we find that the sine begins to diminish, and that the cosine begins to increase numerically but toward the left of O. In other words, the cosine becomes negative, and continues so till OP has completed three right angles. In the same way, as AOP passes through the value of two right angles and becomes reentrant, the sine becomes negative, being thenceforward measured downward till OP has made one complete revolution. After one complete revolution both sine and cosine, and also secant and cosecant, begin to go through exactly the same cycle of changes in magnitude and sign as at first. They are therefore periodic functions, and their period is $2\pi$ or four right angles. The tangent and cotangent, however, go through their cycle of changes in half this period or two right angles. All possible numerical values of the functions are obtained in the first quadrant. It is therefore sufficient in constructing tables of the trigonometrical functions to tabulate for angles from 0° to 90° inclusive. For example, the angle 130° (90° + 40°) has the same sine as the angle of 50° (90° − 40°); and its cosine differs only by being negative. Of greater practical importance than the tables of the functions themselves are the tables of their logarithms. These are generally tabulated for every degree and minute of angle from 0° to 90°; and proportional parts are added by which is readily calculated the number corresponding to an angle involving seconds of arc.

The calculation of the functions and their logarithms is a sufficiently laborious task. It is generally effected by means of series, though the values for certain particular angles can be found by the simplest of arithmetical operations. Thus, the cosine of 60° is evidently ½; sine 60° is therefore ½√3; tangent 60° is √3; and so on. What might be called the fundamental series for the sine and cosine in terms of the arc are:

$$\text{sin. } \theta = \theta - \frac{\theta^3}{1.2.3} + \frac{\theta^5}{1.2.3.4.5} - \frac{\theta^7}{1.2.3.4.5.6.7} + \ldots$$

$$\text{cos. } \theta = 1 - \frac{\theta^2}{1.2} + \frac{\theta^4}{1.2.3.4} - \frac{\theta^5}{1.2.3.4.5.6} + \ldots$$

If we make all the signs in these two series positive we get two other functions of $\theta$, which are called the hyperbolic sine and cosine of $\theta$, and are written sinh. $\theta$ and cosh. $\theta$ respectively. Related to these functions are the hyperbolic tangent, cotangent, secant, and cosecant; and they are connected by relations similar to, though not quite identical with, the ordinary circular functions. We may see, by adding the series with signs all positive, that the sum of the hyperbolic sine and cosine is the exponential of $\theta$. Demoivre's theorem gives the corresponding equation for the circular sine and cosine. The reason for the names circular and hyperbolic may be partially indicated thus: The relation $\cos.^2\theta + \sin.^2\theta = 1$ may be put in the form $x^2 + y^2 = a^2$, which is the equation of a circle of radius $a$, referred to rectangular axes. The equation of the rectangular hyperbola is $x_2 - y^2 = a^2$, to which there corresponds the relation $\cosh._2\theta - \sinh.^2\theta = 1$, The hyperbolic sines and cosines are really exponential functions, and are not periodic. They are of constant occurrence both in the higher analysis and in mathematical physics. To facilitate their use in calculation, tables have recently been constructed.

Besides the series given above, there are many others, some of which are particularly serviceable for calculating the values of the functions or the values of their logarithms. There are also the converse series, by which an angle is found in terms of one of its circular functions. One of the simplest, and at the same time most historically famous, of these is Gregory's series, which expresses an angle in ascending powers of its tangent. It is as follows:

$$\theta = \tan.\theta - \tfrac{1}{3}\tan.^3\theta + \tfrac{1}{5}\tan.^5\theta - \tan.^7\tfrac{1}{7}\theta + \ldots$$

Of great importance are the addition formulæ which express any required function of the sum or difference of two given angles in terms of the trigonometrical functions of these angles. They are readily established for the circular functions by application of the elementary theorems of orthogonal projection. Similar formulæ hold for the hyperbolic functions. As plane trigonometry has to do chiefly with the solution of plane triangles, so spherical trigonometry is devoted to the discussion of spherical triangles. In navigation, geodesy, and astromony the formulæ of spherical trigonometry are in constant use. The ordinary text-books on trigonometry do little more than present the subject in its practical bearings. It is impossible to make any progress in the higher mathematics without a thorough knowledge of the properties of the trigonometrical functions.

**Trigynia,** in botany, the name of various orders in the Linnæan system of classification. They have three styles. The classes Diandria, Triandria, Pentandria, Hexandria, Octandria, Enneandria, Decandria, Dodecandria, Icosandria, and Polyandria have each an order *Trigynia*.

**Triheptylamine,** $C_{21}H_{45}N = (C_7H_{15})_3N$. triœnanthylamine; a liquid obtained by

heating sulphite of œnanthyl-ammonium with a mixture of quicklime and slaked lime. It is pale yellow by transmitted, greenish-yellow by reflected light, strongly efflorescent, and turns brown on exposure to the air; insoluble in water, but soluble in alcohol and ether. Its salts are all deliquescent and form oily drops or syrupy masses.

**Trihilatæ,** in botany, the 50th order in Linnæus' natural system. Genera: *Sapindus, Malpighia, Begonia, Berberis,* etc.

**Trilliaceæ,** in botany, parids; an order of dictyogens; herbs with tubers or rhizomes, simple stems, and verticillate, membranous, netted leaves; flowers large, solitary, hemaphrodite; sepals three, herbaceous; petals three, much larger than the sepals, colored or herbaceous; stamens 6 to 10; styles three to five, free; ovary three to five-celled, ovules in two rows, indefinite; fruit succulent. From the N. temperate zone. Known genera 4, species 30.

**Trilithon,** in archæology, a monument, probably sepulchral, either standing alone or forming part of a larger work, and consisting of three stones: two uprights, connected by a continuous impost or architrave. The best-known examples of trilithons in Great Britain are at Stonehenge, on Salisbury Plain, England. In the trilithons still standing, each of the uprights has a tenon on its surface, and the under sides of the architrave or horizontal piece have each two mortises into which the tenons fit. According to Olaus Magnus similar monuments were formerly erected in Sweden over the graves of nobles and other eminent persons; and Ferguson considered that the trilithon "is only an improved dolmen, standing on two legs instead of three or four."

"We must not, however, attribute too much importance to the similarity existing between the megalithic erections in various parts of the world. Give any child a box of bricks, and it will immediately build dolmens, cromlechs, and trilithons, like those of Stonehenge, so that the construction of these remarkable monuments may be regarded as another illustration of the curious similarity existing between the child and the savage."— Lubbock, "Prehistoric Times" (ed. 1878), p. 133.

**Trillium,** in botany, the typical genus of *Trilliaceæ.* Sepals three, herbaceous; petals three, colored; stigmas three, sessile; berry superior, three-celled, many-seeded. Known species 17, all from North America. The fleshy roots of *T. erectum* (= *T. pendulum*), the beth root, Indian balm, or lamb's quarters, is used as a tonic, antiseptic, etc., by the Shakers. It is about a foot high, with rhomboid leaves, and drooping, fetid, purple flowers.

**Trilobita,** in palæontology, an order of *Crustacea,* to which different positions in the class have been assigned, but which are now regarded as an early and more generalized type from which the living and more specialized Isopoda have arisen. Body usually more or less distinctly trilobate in a longitudinal direction; there is a cephalic shield, generally bearing a pair of sessile, compound eyes; the thoracic somites are movable on one another, and vary greatly in number; the abdominal segments coalesce to form a caudal shield (the pygidium); and there is a well developed upper lip (the hypostome), formed by a doubling of the head shield. The *Trilobita* are exclusively Palæozoic, and range from the Upper Cambrian (in which the Primordial Trilobites of Barrande are found) to the Lower Carboniferous of Europe and America, attaining their maximum in the Silurian. More than 500 species are known, distributed in many genera, which are arranged in about 20 families.

**Trilobite,** in palæontology, any individual of the order *Trilobita.* The body was protected by a well developed chitinous shell, divided laterally into three regions: (1) A cephalic shield; (2) a variable number of body rings; and (3) a caudal shield, tail, or pygidium — commonly found detached from each other. The cephalic shield is usually more or less semicircular, with an elevated portion, the glabella usually grooved, and bounded by the fixed cheeks, to which the free cheeks which bear the eye are attached by what is known as the facial suture, indications of which are present in Limulus. The posterior angles (usually called genal angles) of the free cheek are commonly prolonged into longer or shorter spines. The eyes are sessile, compound, and consist of an aggregation of facets, covered by a thin cornea. The number varies greatly, Barrande having found as few as 14 and as many as 15,000 facets in each eye in different types. Behind the cephalic shield comes the thorax, composed of a number of segments (from 2 to 26), capable of more or less movement on each other; in several genera this freedom of movement was so great that species could roll themselves up into a ball, like a hedgehog. The thorax is usually trilobed, and each body ring exhibiting the same trilobation, being composed of a central, more or less convex portion, the axis, with two accessory portions, the pleuræ. The tail is also composed of a number of segments (from two in *Sao hirsuta* to 28 in the genus *Amphion*), anchylosed or amalgamated. The extremity is sometimes rounded, but may be prolonged into a spine, and the ends of the pleuræ of the tail segments may also be produced into spine-like processes. With regard to the under-surface and appendages of the trilobites much remains to be discovered. The first structure met with on the lower surface was the typostome, a broad, and forked plate, situated in front

of the mouth in many species, and closely resembling the lip-plate of Apus, a recent phyllopod. Next, Woodward found the remains of a maxillary palp in *Asaphus platycephalus;* and in another individual of the same species Billings found what he considered to be the remains of eight pairs of legs; but Dana and Verrill believed them to be the arches to which the legs were attached. From Walcott's examinations of sections of rolled-up specimens, it appears that the thoracic appendages were slender, five-jointed legs, in which the terminal segment formed a pointed claw, and the basal segment carried a jointed appendage, homologous with the epipodite of many recent Crustaceans. On each side of the thoracic cavity was attached a row of bifid, spiral branchial appendages, and appendages serving also as gills were probably attached to the bases of the thoracic limbs. The mouth was situated behind the hypostome, and bounded by four pairs of jointed manducatory appendages, the basal joints of which were partly or entirely modified to act as jaws. Trilobites vary greatly in size, some being scarcely larger than a pin's head, while species of *Asaphus* have been met with two feet in length. They appear to have lived on muddy bottoms in shallow water, feeding on small marine animals, and probably swam on their backs, as do the recent *Apus* and the larval forms of *Limulus.*

**Trilobite Schists,** in geology, a name originally applied by Murchison to the Llandeilo flags, from the fact that trilobites were recorded from Llandeilo by Lhwyd as early as 1698.

**Trilobite Slates,** in geology, a name given by the Rev. D. Williams to the Pilton beds, from the fact that *Phacops latifrons* has been found in them.

**Trilogy,** a series of three dramas, which, though complete each in itself, bear a certain relation to each other, and form one historical and poetical picture. The term belongs more particularly to the Greek drama. In Athens it was customary to exhibit on the same occasion three serious dramas, or a trilogy, at first connected by a sequence of subject, but afterward unconnected, and on distinct subjects, a fourth or satyric drama being also added, the characters of which were satyrs. Shakespeare's "Henry VI." may be called a trilogy.

**Trimastigidæ,** in zoölogy, a family of *Flagellata Pantostomata,* with four genera. Animalcules naked, free-swimming or temporarily adherent; flagella three in number, equal or sub-equal, inserted close to each other; no distinct oral aperture.

**Trimastix,** in zoölogy, a genus of *Trimastigidæ,* with one species, *T. marina,* found in salt water, with decaying vegetation. Animalcules ovate or pyriform; endoplast with contractile vesicle conspicuous.

**Trimble, Isaac Ridgeway,** an American military officer; born in Culpeper co., Va., May 15, 1802; was graduated at the United States Military Academy in 1822; was surveyor of the military road between Washington and the Ohio river and between Boston and New York in 1822–1832. In the latter year he resigned his commission and devoted himself to civil engineering. He was made chief engineer of the Baltimore and Susquehanna railroad in 1834, and finished its line from Baltimore to New York by 1837; was later chief engineer of the Philadelphia, Wilmington, and Baltimore railroad. When the Civil War began he was in the West Indies, but hastened to Baltimore, where he was given command of the non-uniformed volunteers organized for the purpose of defending that city against Union troops. In May, 1861, he became colonel of engineers in the Confederate army, and was assigned to the construction of forts and field works for the protection of Norfolk. After finishing these he was promoted Brigadier-General and was then ordered to construct batteries at Evansport on the Potomac for the purpose of blocking that waterway against Union vessels. By the aid of these he successfully controlled the passage of boats in the winter of 1861–1862. While under General Ewell he chose the Confederate position for action at Cross Keys, June 8, 1862. During the engagement at Gaines's Mills and the ensuing seven days' battle he led the 7th brigade of Ewell's Division. He distinguished himself in the action at Slaughter's Mountain, Aug. 12, 1862, and on the 27th of the same month he took Manassas Junction with its ammunition and supplies. He was promoted Major-General in April, 1863, and during the battle of Chancellorsville had command of a division in the 2d corps of Jackson's army. On the third day of the engagement at Gettysburg he took part in the famous charge of Gen. George E. Pickett. He there lost a leg and was taken prisoner. He was not exchanged till April, 1865, after being detained a prisoner at Johnson's Island for 21 months. He hastened to join Lee, but when he arrived at Lynchburg he discovered that the the Confederate army had surrendered the day before. He died in Baltimore, Md., Jan. 2, 1888.

**Trimera,** in entomology, one of the sections into which Latreille divided the Coleoptera. The tarsi have only three true joints, the joint which is apparently the analogue of the third joint in the Pentamera being rudimentary at the base of the claw-joint. The section comprises two families, *Endomychidæ* and *Coccinellidæ,*

each with a single genus. The most familiar species is *Coccinella septempunctata*, the common ladybird.

**Trimerel'a,** in palæontology, the type genus of *Trimerellidæ* with two species from the Lower and Upper Silurian of Canada.

**Trimerellidæ,** a family of *Brachiopoda*. Shell inequivalve, calcareous; beaks usually prominent, or sometimes obtusely rounded, and either massive or solid, or divided by a partition into two chambers. There is a well-developed hinge area, and a wide deltidium, bounded by two ridges, the inner ends of which serve as teeth, though true teeth are not present. Each valve is furnished with muscular platforms. The genera are characteristic of the Upper Silurian, and especially of the Guelph Formation of North America.

**Trimeresurid,** in zoölogy, any individual of the genus *Trimeresurus*. They are venomous arboreal snakes, in color resembling the foliage among which they live, naturally sluggish till disturbed, when they become fierce and aggressive, drawing back the head and anterior part of the body and then dashing forward with great rapidity. They are seldom more than two feet long, and their bite causes fever, nausea, and vomiting; but the bite of larger specimens causes much more serious, and sometimes fatal symptoms.

**Trimeresurus,** in zoölogy, a genus of *Crotalidæ*, with 16 species ranging over India, Formosa, the Philippines, and Celebes. Head triangular, covered above with small scales, except the foremost part of the snout and above the eyebrows, body with more or less distinctly keeled scales; tail prehensile.

**Trimerous,** in botany, having three parts; having the number three running through its several organs. Used when there are three divisions of the calyx or three sepals, three divisions of the corolla or three petals, and three stamens. In entomology, of or belonging to the *Trimera*.

**Trimethylamine** ($N(CH_3)_3$), an organic compound which is abundantly present in the liquor in which salt herrings are preserved. When methyl iodide is digested with an alcoholic solution of ammonia, a mixture of various organic iodides is produced, among others the iodide of tetramethyl-ammonium, which being sparingly soluble in water is readily separated by crystallization. The base is then obtained free by treatment with silver oxide, and the tetramethyl-ammonium hydrate ($N(CH_3)_4OH$) so produced decomposes when heated, yielding trimethylamine, which is gaseous at ordinary temperatures, readily soluble in water, and possesses a strong alkaline reaction. With acids it forms soluble salts. There is a similar ethyl compound ($N(C_2H_5)_3$), a powerful alkaline liquid, boiling at 91° C.

**Trimethyl Glycerin,** $C_6H_{14}O_3 = \begin{matrix}(C_3H_5)'''\\(CH_3)_3\end{matrix}\Big\} O_3$, trimethylin, a liquid formed by heating acrolein, methylic alcohol, and acetic acid for several hours to 100°. It has an agreeable odor, sp. gr. .9433 at 0°, is soluble in water, and boils at 148°.

**Trimorphism,** in biology, the existence in certain plants, and animals of three distinct forms, especially in connection with the reproductive organs. In trimorphic plants there are three forms, differing in the lengths of their pistils and stamens, in the size and color of their pollen grains, and in some other respects; and, as in each of the three forms there are two sets of stamens, the three forms possess altogether six sets of stamens and three kinds of pistils. These organs are so proportioned in length to each other that half the stamens in two of the forms stand on a level with the stigma of the third form. To obtain full fertility with these plants, it is necessary that the stigma of the one should be fertilized by pollen taken from the stamens of corresponding height in another form. Hence, six unions are legitimate, *i. e.*, fully fertile, and 12 are illegitimate, or more or less unfertile. Wallace has shown that the females of certain butterflies from the Malay Archipelago appear in three conspicuously distinct forms without intermediate links. In crystallography, the occurrence of certain forms in minerals which have the same chemical composition, but are referable to three systems of crystallization.

**Trimurti,** in comparative religion, the later Hindu triad = Brahma, Vishnu, and Siva — considered as an inseparable unity. The Padma Purana, which, as a Purana of the Vaishnavas, assigns to Vishnu the highest rank, thus defines the Trimurti; "In the beginning of creation the great Vishnu, desirous of creating the world, produced from the right side of his body himself as Brahma; then, in order to preserve the world, he produced from the left side of his body Vishnu; and in order to destroy the world he produced from the middle of his body the eternal Siva. Some worship Brahma, others Vishnu, one, yet threefold, creates, preserves, and destroys; therefore let the pious make no difference between the three." Trimurti, therefore, implies the unity of the three principles of creation, preservation, and destruction, and is an expression of philosophical, rather than of popular belief. The symbol of the Trimurti is the mystical syllable *o* ($=a+u$) *m;* where *a* stands for Brahma, *u* for Vishnu,

and *m* for Siva. Also a representation of the Hindu triad. It consists of one human body with three heads, that of Brahma in the middle, that of Vishnu at the right, and that of Siva at the left.

**Trincomalee,** a seaport, naval station, and harbor on the N. E. coast of Ceylon; 110 miles N. E. of Kandy. The town is built on a bold peninsula, which divides the inner and outer harbors. Here the Malabar invaders of Ceylon built the "Temple of a Thousand Columns," to which pilgrims flocked from all parts of India. This celebrated shrine was demolished in 1622 by the Portuguese, who fortified the heights with the materials derived from its destruction. It was next held by the Dutch, and subsequently by them and the French alternately, till the capture of Ceylon by the British in 1795. The Bay of Trincomalee is landlocked; the harbor is renowned for its extent and security; unlike every other in the Indian seas, it is accessible to every description of craft in every variation of weather, but unluckily it lies out of the course of trade, Colombo having in this respect a great advantage over it.

**Trine, Ralph Waldo,** an American author; born in Mt. Morris, Ill., Sept. 9, 1866; was graduated at Knox College, Galesburg, Ill., in 1891, and then pursued studies in history and social and political science at Johns Hopkins University. He became deeply interested in social problems; was made director of the American Humane Society and the Massachusetts Society for the Prevention of Cruelty to Animals. His publications include: "The Life Books" (3 vols. 1896–1898); "The Greatest Thing Ever Known" (1898); "Every Living Creature" (1899); "Character-Building Thought Power" (1900); etc.

**Trine Immersion,** in Church history, the name given to the practice in the primitive Church of dipping a person who was being baptized three times beneath the surface of the water, at the naming of the Three Persons of the Holy Trinity. When circumstances rendered baptism by affusion necessary, the affusion was also trine, as it is in the present day.

**Tringa,** in ornithology, a genus of *Scolopacidæ* (or, in classifications in which that family is divided, of *Totaninæ* or *Tringinæ*), with 20 species, universally distributed. Beak rather longer than head, sometimes decurved, rather flexible, compressed at base, blunt toward the point, both mandibles grooved along the sides; nostrils lateral, in the membrane of the groove; legs moderately long, slender, lower part of tibia naked; three toes in front, divided to their origin, one behind, small, and articulated to the tarsus; wings moderately long, pointed, first quill the longest.

**Tringoides,** a genus of *Scolopacidæ* (or *Totaninæ*), with six species, universally distributed. Bill rather straight above, curved at tip, groove extending nearly whole length of bill; tail rounded, broad.

**Trinia** (named after Dr. C. B. Trinius, a Russian botanist), honewort; a genus of *Ammineæ* or *Amminidæ*. Diœcious; calyx teeth obsolete; petals of the barren flowers lanceolate, with a narrow, involute point, those of the fertile flowers ovate, with a short, inflected point; fruit ovate, carpels with five prominent ribs and single vittæ beneath them. Known species eight, from Southern Europe and temperate Asia.

**Trinidad,** a city and county-seat of Las Animas co., Col.; on Las Animas river, and on the Atchison, Topeka, and Santa Fé, the Union Pacific, and the Denver and Rio Grande railroads; 200 miles S. of Denver. Here are National and savings banks, numerous churches, the Rice Institute, an academy, several daily and weekly newspapers, and electric lights. The city has grist mills, planing mills, coking ovens, a brewery, and large railroad car shops, etc., and an assessed property valuation of about $2,000,000. Pop. (1900) 5,345; (1910) 10,204.

**Trinidad,** one of the British West India Islands; in the extreme S. of the group, being only 7 miles from the coast of Venezuela, the Gulf of Paria (an extremely safe anchorage) lying between. It is about 50 miles long, varying in breadth from 30 to 35 miles; area, 1,755 square miles. Three ridges of mountains run E. and W., one fringing the N. coast and reaching an elevation of 3,000 feet. The island has several tolerably large rivers. A remarkable phenomenon is a pitch lake near the village of La Brea, composed of bituminous matter floating on the surface of fresh water, about 3 miles in circumference, and 138 feet above the sea. The soil is very rich and productive. The climate is hot and moist, but not unhealthy; the mean maximum is 87.7°, and the mean minimum 70° F.; and the rainfall is about 74 inches. The chief town, Port of Spain, is one of the finest towns in the West Indies (pop. 60,000). There is another town called San Fernando (pop. 7,641), with two or three pretty villages. The most important products are cocoa, sugar, rum, molasses, coffee, cocoanuts, tobacco, bitters, asphalt, and fruit. A third of the trade is with Great Britain, and a fourth with the United States. Pop. (1901) 255,148, mainly French (speaking a patois), with Spanish and English colonies, and many East Indian coolies. There are over 50 miles of railway in the island, which with Tobago forms a crown colony, ruled by a governor, an executive council of four, and a legislative council of 18 members. Trinidad was

discovered by Columbus in 1498, but no permanent establishment was founded there till 1532 by the Spaniards. It suffered at the hands of the English (Sir Walter Raleigh in 1595), the Dutch (1640), and the French (1677 and 1690). In 1797 it first fell into the hands of the British, who were confirmed in possession of it in 1802.

**Trinitarians,** an order of monks founded at Rome in 1198 by St. John of Matha, a native of Provence, and an old French hermit, Felix of Valois, to redeem Christian captives out of the hands of the infidels. The order was sanctioned by Innocent III.; the rule was that of St. Austin, with particular statutes; the diet was of great austerity; and the habit, at least in France, was a soutane and scapular of white serge, with a red and blue cross on the right breast. At one time the order possessed 250 houses, and it was estimated in the 17th century, that, since its foundation, it had been instrumental in rescuing more than 30,000 Christian captives from what was practically slavery. A reform took place in 1599, and resulted in the erection of the congregation of Discalced Trinitarians in Spain, in which country the order (reformed and unreformed) was suppressed in the reign of Isabella II.

**Trinity,** a term used to express the doctrine of Three Persons in one Godhead, which is held alike by the Roman, Greek, and Anglican Churches, and by the greater number of Nonconformist communions. It is indicated in the Apostles' Creed, stated more explicitly in the Nicene Creed, and set out at length in the Athanasian Creed. The First Article of the Church of England states the doctrine in terms that would be accepted by sister churches, and by orthodox dissenters generally: "There is but One Living and True God. . . . And in Unity of this Godhead there be Three Persons, of one substance, power, and eternity; the Father, the Word, and the Holy Ghost." Protestant theologians deduce the doctrine of the Trinity from texts in which (*a*) the Unity of God is affirmed (Deut. vi: 4; Isa. xliv: 6; Mark xii: 29–32; Eph. iv: 6); (*b*) the Divinity of Christ is shown from the fulfillment of Messianic prophecies, or directly affirmed (I Pet. ii: 7, 8; Isa. viii: 13, 14; John xii: 41; Isa. vi: 1; II Pet. iii: 18; Isa. xliii: 11; Rev. xxii: 13; Isa. xliv: 6; Matt. xi: 10; Mal. iii: 1; I Cor. x: 9; Ps. lxxviii: 18 and xcv: 9; John iii: 29; Isa. liv: 5; John i: 1, xiv: 11, xx: 28; Rom. ix: 5; III Cor. v: 19, 20; Col. ii: 8, 9; II Pet. i: 2; I John v: 20); and (*c*) the Divinity of the Holy Ghost is affirmed (Matt. ix: 38; Acts xiii: 4; John vi: 45; I Cor. ii: 13; John xiv: 17; I Cor. xiv: 25; Ezek. viii: 1–3; Matt. xii: 28; Acts v: 9; I Cor. ii: 11; II Cor. i: 3). The word "Trinity" is not found in the Scriptures, and is said to have been first used by Theophilus, Bishop of Antioch, in the 2d century; but from the texts quoted the early Church recognized that the Sacred writings taught (1) that there is one God; (2) that Christ was called God; and (3) that the Holy Ghost was also called God; and from the combination of these truths the doctrine of the Trinity was deduced. Moreover it was considered that the doctrine was clearly expressed in the words of Christ's commission to His disciples (Matt. xxviii: 19) and in the Apostolic benediction (II Cor. xiii: 14). Early heresies with respect to the Trinity were Arianism, Tritheism, Sabellianism, and Patripassianism. The Council of Nice (A. D. 325) by affirming the divinity of Christ, and that of Constantinople (A. D. 381) by affirming the divinity of the Holy Ghost, while insisting on the Unity of God, declared the doctrine of the Trinity in Unity to be the doctrine of the Church. From that time it was never called in question except by a few obscure sects, till the Reformation, when Unitarianism became one phase of Protestantism.

In ecclesiastical art a symbolical representation of the mystery of the Trinity frequent in Christian art. The symbol which has endured the longest is the mystic triangle, which may be found on the tombs of the early Christians. The union of the three persons in one Godhead was also symbolized by a Latin inscription, disposed in geometric lines, containing at each angle the names of the Father, Son, and Holy Ghost, each connecting band being inscribed with the words *non est*. In the midst of the triangle was the holy name of God, again connected by bands with those of the Trinity, each of which bore the one word *est*. At times an attempt was made to render the same mystery pictorially visible by three heads or three faces on one neck, the eyes becoming part of each individual face. (See TRIMURTI.) An equilateral triangle, or a combination of the triangle, the circle, and sometimes the trefoil, was also used for the same purpose.

**Trinity Bay,** a large bay on the N. E. coast of Newfoundland. The peninsula of Avalon is nearly surrounded by it. Its chief ports are Trinity and Heart's Content.

**Trinity College,** an American educational institution, established in Hartford, Conn., in 1823. It bore the name of Washington College till 1845. The original site of the campus was that now occupied by the State Capitol. In 1878 the ground was sold to the city of Hartford, and 78 acres were secured about a mile S. of its former location. Here a number of beautiful buildings were erected in the early French Gothic style. The main structure is in the

form of a quadrangle, being 1,050 feet in length and 376 feet in width and incloses three courts. The other edifices include a gymnasium, a hall of science, an observatory, an alumni hall, and a president's house. The institution offers four courses of study, including the classical, scientific, and English. The college property is estimated at more than $1,200,000 in value. The college has productive funds exceeding $825,000; grounds and buildings valued at over $300,000; scientific apparatus, etc., $36,000; volumes in the library, about 60,000; average faculty, 23; students, 215; graduates, over 1,500.

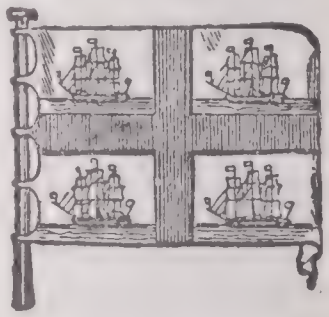
**Trinity College,** a coeducational institution in Durham, N. C.; opened in 1859 under the auspices of the Methodist Episcopal Church, South; has endowment funds exceeding $450,000; buildings and grounds valued at over $625,000; scientific apparatus, etc., $81,000; volumes in the library, about 40,000; average number of faculty, 35; average student attendance, 475; graduates, over 800.

**Trinity College,** a famous institution in Cambridge, England; founded by Henry VIII., in 1546 on the site and out of the revenues of Michael-house (1324), King's Hall (1337), and other ancient societies. To the 60 fellowships and scholarships of his foundation Queen Mary added 20 scholarships. The scholarships, which are tenable up to the M. A. degree, have a yearly value of from £100 to £30, the sizarships of about £70; and there are further three annual minor scholarships of £75, and three of £50, tenable for three years, besides 16 exhibitions for scholars from Westminster, St. Paul's, Lynn, Shrewsbury, etc., and numerous prizes. The fellows, with certain exceptions, must take holy orders within seven years after their M. A., and the college may elect professors or other distinguished literary or scientific men to regular or honorary fellowships. The greatest of all the Cambridge colleges, Trinity is more conspicuous for the extent than the special architectural beauty of its buildings. Noteworthy, however, are Nevill's Fountain, the three great gateways by which the three chief courts are entered, the Gothic Hall with its high-peaked roof, the chapel (redecorated 1875), the library designed by Wren, and containing nearly 100,000 volumes, the Master's Lodge, with its state rooms, where royalty and the judges are received, and the rich collection of busts and statues of former members — of Newton by Roubillac, Porson by Chantrey, Byron by Thorwaldsen, Barrow, Macauley, Whewell, Sedgwick, Tennyson, etc.

**Trinity College,** a noteworthy college in Oxford, England; founded by Richard de Hoton, Prior of Durham, in 1290, for the education of the student-monks of Durham. It was the first college, after Balliol, which was founded by a layman, and was further remarkable as having been, like St. John's, founded by a Roman Catholic after the Reformation. It was rebuilt and improved by Sir Thomas Pope, in 1554. A Renaissance chapel was built in 1694, in which is a fine altar-piece, and a beautiful carved screen.

**Trinity College,** or **The University of Dublin,** the largest and most important educational institution in Ireland. It is believed to have been founded by Queen Elizabeth in 1591, though some authorities assert that she merely endowed and Protestantized the school. These latter give the credit for its establishment to Alexander Bigner or Bignor, an ecclesiastic of the 13th century. It has extensive buildings which inclose several quadrangles. Corinthian columns ornament the principal front, the chapel has a Corinthian portico and the decorations of the fine library are also Corinthian.

**Trinity House,** a name borne by five maritime societies of Great Britain; situated in London, Hull, Newcastle-on-Tyne, Leith, and Dundee. Probably all, or most of them, were originally partly religious and partly secular establishments founded by seamen, their chief original objects being probably mutual assistance and the care of aged and infirm seamen. From the 14th century onward various public duties and privileges were assigned to them by royal charters or acts of Parliament, such as providing lighthouses, buoying channels, and licensing pilots; and powers were given to them to levy dues on shipping or cargoes. With one important exception, these duties and powers have been reduced or withdrawn. Dundee House is now only a benefit society. Leith retains its public duties as a pilotage authority, as also do Newcastle and Hull, while the last also looks after the lighthouses and buoys of the Humber. All of them continue to give pensions, or homes and pensions, to members, and some assistance to destitute seafarers.



TRINITY HOUSE FLAG.

On the other hand, the London Trinity House, called the Corporation of Trinity House of Deptford Strond, is entrusted with the management of the general lighthouse and buoyage system of England and Wales, and with a supervising authority over local lights and buoys, and has besides a partial control over the lighting and buoyage systems of Scotland and Ireland. In 1514 this

society was incorporated by royal charter of Henry VIII.; and its privileges were confirmed and extended by subsequent charters, particularly by that of James II. in 1685 In 1600 its first lighthouse was built at Caistow, after which date, as lighthouses increased in number, many of them fell into the hands of private individuals by lease, or patent, or act of Parliament; but by an act of William IV. private rights in lighthouses were compulsorily purchased by that Trinity House. After 1853 all light duties with those of the Scotch and Irish Lighthouse Boards, were paid to the paymaster-general, and were toward the formation of the Mercantile Marine Fund; and all disbursements for lighthouses were to be paid out of that fund after being approved by the Board of Trade. The Merchant Shipping Act of 1854 and subsequent acts laid on the London Trinity House the additional duty of removing wrecks around the coast when dangerous to navigation. The power of the London Trinity House to appoint and license pilots was enlarged by the Merchant Shipping Act of 1854, and again in 1862. The Pilots' Fund and several special charities are administered by it.

The corporation of the London Trinity House consists of a master, a deputy-master, 13 acting elder brethren, 11 honorary elder brethren, and an unlimited number of younger brethren. The master and honorary elder brethren are chosen on the ground of eminent social or official position. The younger brethren all belong either to the naval service or the mercantile marine, and are admitted by the court of elder brethren. The deputy-master and acting elder brethren are elected by the court of elder brethren from such of the younger brethren as are possessed of the qualifications of having obtained the rank of commander in the navy four years previously, or having served as master in the merchant service on foreign voyages for at least four years. The board discharges its duties by means of committees and sub-committees for special purposes. Two elder brethren of Trinity House assist the Court of Admiralty at the hearing of every suit for collision, and occasionally in suits for salvage; but their duty is to guide the court by advice only.

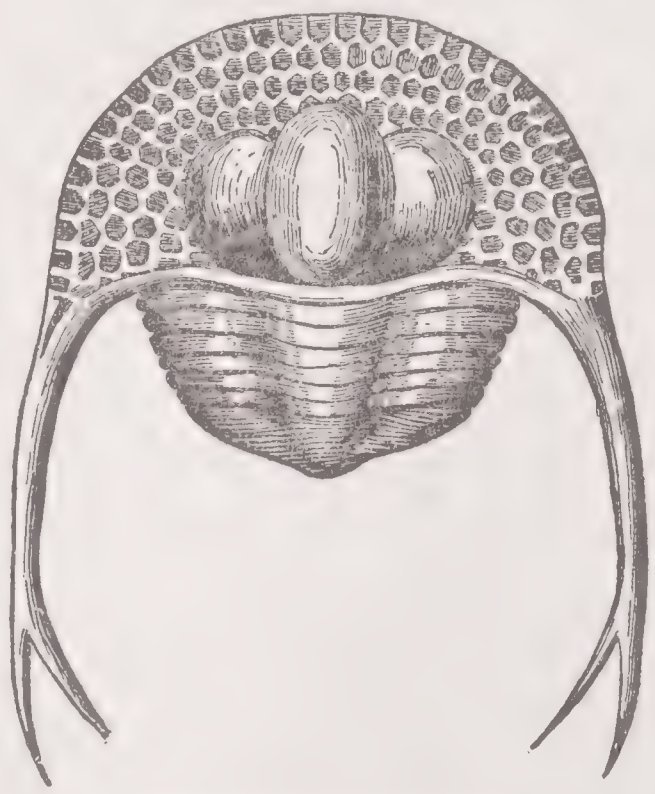
**Trinity River,** a river in Northwestern California. It enters the Klamath river in Humboldt county. It is about 130 miles long. A river in Texas, formed by branches called the Elm or East Fork, and West Fork, which unite in Dallas county about 4 miles above Dallas. It is about 500 miles long and is navigable, except at low water, for nearly 350 miles. It flows through a very fertile region.

**Trinity Sunday,** the Sunday after Whitsunday. It was definitely established as a Church festival by Pope John XXII. in 1334. All the principal feasts occur in the half-year between Advent Sunday and Trinity, and all the Sundays from Trinity to Advent, are called Sundays after Trinity.

**Trinkerite,** an amorphous mineral, occurring in large masses in the lignite of Carpano Albona, Istria, and also in Styria; hardness, 1.5–2; sp. gr., 1.025; luster, greasy; color, hyacinth-red to chestnut-brown; transparent to translucent. Fuses at 168–180°; only slightly soluble in alcohol or ether. The mean of two analyses yielded: Carbon, 81.5; hydrogen, 11.05; sulphur, 4.4; oxygen, 3.05 = 100, which approaches very closely to the composition of tasmanite.

**Trinoda Necessitas,** three species of contributions to which in Anglo-Saxon times all the lands of England, were subject — viz. *bricg-bot,* for keeping the bridges and highways in repair; *burh-bot,* for keeping the fortresses in repair; and *fyrd,* for maintaining the military and naval force.

**Trinucleus,** the type genus of *Trinucleidæ.* Body distinctly trilobed; margin of head-shield composed of two lamellæ, and



TRINUCLEUS PONGERARDI.

perforated by numerous foramina; genal angles prolonged into conspicuous spines, usually single, but forked in *T. pongerardi;* glabella prominent and pear-shaped with mere traces of lateral grooves; facial sutures rudimentary; cheeks tumid, and generally furnished on each side with a small tubercle seemingly representing the eyes; body rings six; tail triangular, with a distinct axis, and having its margin entire and striated.

**Trinucleidæ,** in palæontology, a family of *Trilobita,* with four genera, from the

Lower Silurian. The head shield is enormously developed, with a wide margin, or limb, which is usually perforated by rounded pores; glabella well marked, eyes generally wanting, facial sutures sometimes absent, body rings reduced to five or six in number, with grooved pleuræ, tail large and sub-triangular.

**Trio,** a musical composition for three voices or for three instruments.

**Trioctile,** in astrology, an aspect of two planets with regard to the earth when they are three octants or eight parts of a circle, that is 135 degrees, distant from each other.

**Triodia,** in botany, heath grass; a genus of *Aveneæ*. Panicle racemed; spikelets few, terete, with two to four fertile florets; upper flower imperfect. Flowering glumes convex, three-toothed, keeled, three-nerved; palea ciliate; scales broad, fleshy; stigmas feathery; ovary stalked. Six species, all from the old world.

**Triodon** (named from the fact that the upper jaw is divided by a suture in the middle, while the lower jaw is entire, the fish apparently having three large white teeth), the sole genus of *Triondontina,* with a single species, *T. bursarius,* from the Indian Ocean.

**Triodontina,** in ichthyology, a group of *Gymnodontes*. Tail rather long, with separate caudal fin; abdomen dilatable into a very large, compressed, pendant sac; upper jaw divided by a median suture, lower simple.

**Triœcia,** in botany, plants having the male flowers on one individual, the females on another, and hermaphrodites on a third.

**Trionychidæ,** in zoölogy, mud or soft tortoises, fresh-water turtles; a family of *Chelonia,* with three genera. Shell much depressed, covered with soft skin, and not with epidermic plates; digits movable, strongly webbed, each foot with only three sharp claws, belonging to the three inner of the five digits, as in crocodiles; head retractile within the buckler. The jaws are covered with fleshy lips, and the snout is produced in a short tube bearing the nasal orifices, and enabling the animal to breathe while the rest of the head is submerged under water. The species are thoroughly aquatic and carnivorous, and inhabit rivers, streams, and arms of the sea, in the hotter parts of North America, Asia, and Africa. They are usually light-colored beneath, but the carapace is generally mud-colored.

**Trionyx,** in zoölogy, the type genus of *Trionychidæ,* with 17 species, having the range of the family. Among the best known are *T. ferox,* the soft-shelled tortoise, from the United States and Central America; *T. javanicus,* the Javanese, and *T. gangeticus,* the gangetic trionyx; and *T. niloticus,* the nilotic trionyx, which attains a length of three feet, and is of great use in keeping down the number of crocodiles by devouring their eggs and young.

**Triosteum,** in botany, a genus of *Loniceræ*. Hairy, perennial herbs, with connate leaves, a tubular corolla swollen at the base, five stamens, and drupaceous fruit, generally with three cells. *T. perfoliatum,* in small doses, is a mild cathartic, in large ones it produces vomiting. Its dried and roasted berries have been used as a substitute for coffee.

**Trioulzio, Christinade.** See Belgiojoso, Princess of.

**Trioxamylamine** $(C_5H_{11}O)_3N$; a base obtained by heating anhydrous valeral-ammonia to 130° in a sealed tube for eight hours. It is a colorless viscid oil, having, when heated, a pungent odor, is slightly soluble in water, soluble in alcohol; sp. gr., .879 at 22°. It has a strong alkaline reaction, and when distilled is partially decomposed with evolution of ammonia.

**Trioxide,** a term applied to an oxide in which one atom of the metal is combined with three atoms of oxygen, thus: chromium trioxide, $CrO_3$.

**Triparted,** in botany, parted into three segments. In heraldry, parted into three pieces. Applicable to the field as well as to ordinaries and charges; as, triparted in pale, a cross triparted.

CROSS TRIPARTED.

**Triphæna,** or **Tryphæna,** in entomology, yellow underwing, a genus of *Noctuidæ*. Antennæ of the male slightly pubescent; abdomen not crested, flattened, terminating in a truncate tuft of hair; fore wings elongate, thick; hind wings well developed. The larva, which is called the surface grub, thick, larger posteriorly. It feeds on various low plants, and the chrysalis is subterranean.

**Triphanite,** in mining, a compact, reddish mineral substance, accompanying large crystals of analcime at the Kilpatrick Hills, Dumbartonshire, Scotland; supposed to be a variety of cluthalite. Composition undetermined.

**Triphasia,** in botany, a genus of *Aurantiaceæ*. Stamens six, ovary stalked, style thick. Reduced now to one species, though three others were formerly included in it, *T. aurantiola* (=*Limonia trifoliata*) is a spiny shrub, the leaves with three ovate leaflets, has white, sweet-scented flowers, and small yellow berries, which have an agreeable orange taste. It is a native of Southern China, but is now cultivated in the East and West Indies and in European gardens.

**Triphyline,** or **Triphylite,** a mineral of somewhat limited distribution; crystallization, orthorhombic; hardness, 5.0; sp. gr., 3.54–3.6; luster, subresinous; color, greenish-gray, sometimes bluish. Composition: A phosphate of the protoxides of iron, manganese, and lithium, with the formula $(FeO,MnO,LiO)_3PO_5$. Like all minerals containing protoxide of manganese, it is liable to alteration by oxidation and hydration; hence the minerals heterosite, pseudotriplite, alluandite, and melanchlore.

**Triphysites,** in Church history, the name given to those prelates, who at the councils of Toledo (A. D. 684–688) carried their opposition to the Monophysites and Monothelites to such an extent as to profess belief in a third nature in Christ, resulting from the union of the divine and human natures.

**Triplaris,** in botany, the typical genus of *Triplareæ*; trees or shrubs with alternate, shortly-stalked, entire leaves, with short ochreæ, inflorescence racemose, and a three-edged nut with winged angles. The trunk and branches of *T. americana,* a native of tropical America, are chambered, and serve for the habitation of ants.

**Triple Alliance,** an alliance between the States-General and England, against France, for the protection of the Spanish Netherlands; was ratified Jan. 23, 1668. Sweden joined the league, April 25, and it then became known as the Triple Alliance. Another called the Second Triple Alliance, between England, France, and Holland, to oppose the designs of Cardinal Alberoni, the Spanish minister; signed by the English and French, Nov. 28, 1716, and by the Dutch at The Hague, Jan. 4, 1717. A Triple Alliance between Great Britain, Russia, and Austria, was concluded against France at St. Petersburg, Sept. 28, 1795. A fourth one was formed about 1883 between Germany, Austria-Hungary, and Italy against Russia and France.

**Triple Star,** a star which, under a powerful telescope, is resolved into three, often of different colors. Gamma Andromedæ is a triple star. Its principal constituent is of the third magnitude, and of an orange-yellow color. The two others seem like a single one between the fifth and sixth magnitude; both are bluish.

**Triplet,** in music, a combination of three notes to be played in the time of two. They are joined by a slur and distinguished by having the figure 3 above them.

**Triplite,** in mineralogy, an orthorhombic mineral, occurring only in imperfect crystals; hardness, 4–5.5; sp. gr., 3.44–3.8; luster, resinous to adamantine; color, shades of brown to black; streak, yellowish-gray to brown. Composition: Phosphoric acid, 22.7; protoxide of iron, 16.6; protoxide of manganese, 32.2; iron, 6.4; magnesium, 1.8, calcium, 1.5; fluorine, 8.8 = 100, which corresponds with the typical formula $3RO.PO_5 + RF$.

**Triploblastic,** in embryology, of, belonging, or relating to the triple division in the blastoderm outside the yolk in the ovum of mammals, birds, etc. Previous to segmentation the blastoderm is single, then a bilaminar arrangement arises; finally it separates into outer, middle, and inner blastodermic membranes: The ectoderm, mesoderm, and endoderm; called by Foster and Balfour, the epiblast, mesoblast, and hypoblast.

**Triploidite,** a monoclinic mineral, found in distinct crystals, also fibrous, divergent, massive; crystals with vertical striations; hardness, 4.5–5 sp. gr., 3.697; luster, vitreous to adamantine; color, yellowish to reddish-brown, wine-yellow, hyacinth-red; streak, grayish-white; fracture, sub-conchoidal. Composition: Phosphoric acid, 31.91; protoxide of iron, 16.18; protoxide of manganese, 47.86; water, 4.05 = 100. Formula, $R_3P_2O_8 + R(OH)_2$, where R = Fe,Mn. Found at Branchfield, Fairfield co., Conn., associated with various other minerals new to science, in a vein of albite granite.

**Tripod,** in classical antiquity, a bronze altar, having three legs or feet, and frequently also three rings at the top to serve as handles. A tripod was one of the attributes of Apollo, and originated in the custom of seating the pythoness, or prophesying priestess, in a triple-footed seat, over the vapor which ascended from a mystic cavern at Delphi, and which was believed to have the power of producing sacred inspiration, and the ability of foretelling future events. Highly ornamented tripods of similar form, made of precious metals, were given as prizes at the Pythian and Nemean games and elsewhere, and were frequently placed by grateful worshipers as votive offerings in the temples of different gods.

**Tripoli,** a province of the Ottoman empire; the extreme E. of the Barbary States of North Africa, stretching along the whole extent of both the greater and lesser Syrtes (the gulfs of Cabes and Sidra); bounded on the W. by Tunis, on the S. (very vaguely) by the Libyan Desert and Fezzan, on the E.—if we include the plateau of Barca—by Egypt, and on the N. by the Mediterranean Sea; area roughly estimated at 406,000 square miles. Tripoli is less mountainous than the rest of Barbary, for the Atlas range terminates here in a couple of chains running parallel to the coast and never exceeding 4,000 feet in height. There are no rivers, and rain seldom falls during the long hot summers, but the heavy dew sup-

ports vegetation in favored spots. The climate is extremely uncertain. The coast region (about 1,100 miles in length) is very fertile about Tripoli and Mesurata, where all sorts of tropical fruits, grain, wine, cotton, madder, etc., are produced; but further E. along the shores of the Gulf of Sidra, reigns sandy desolation. The interior yields senna, dates, and galls, and the carob and lotus are indigenous. Sheep and cattle are reared in great numbers, and there is a hardy breed of small but excellent horses, besides strong and beautiful mules. The commerce of the country consists in exporting, principally to Malta and the Levant, the products of the country and of the interior of Africa (gold dust, ivory, natron, and ostrich feathers), which are brought hither in caravans across the desert. The imports (which consist chiefly of European manufactures) have been declining gradually of late years, owing partly to the new direction which the trade of Central Africa is assuming, and partly to the abolition of the slave trade, which has stopped the demand for many of the commodities that supported the traffic, Nevertheless Tripoli is still an important mart of the caravan trade with the interior.

Tripoli is subdivided into four *livas* or provinces — Tripoli, Benghazi (Berenice), Mesurata, and Gadames. The governor-general has the title, rank, and authority of a pasha of the Ottoman empire. He is appointed by the Sultan, and in his turn appoints the beys or subordinate governors of the provinces; but many of the chief officers of state are nominated from Constantinople. The military force of the country consists of a body of Turkish soldiers, formerly about 3,000, but increased in 1885 to 17,000 in number, whose business is to keep down insurrections, but who were formerly chiefly expert in creating them. The natives pay to the Turkish government, by way of tribute, a 10th of all the products of the soil; and there are, besides, the onerous special taxes on date trees, etc., common to Mohammedan countries.

From the Phœnicians Tripoli passed into the hands of the rulers Cyrenaica (Barca), from whom it was wrested by the Carthaginians. It next belonged to the Romans, who included it within the province of Africa, and gave it the name of Regio Syrtica. About the beginning of the 3d century A. D. it became known as the Regio Tripolitana (on account of its three principal cities, Œa, Sabrata, and Leptis, which were leagued together), and was probably raised to the rank of a separate province by Septimius Severus, who was a native of Leptis. Like the rest of North Africa, it was conquered by the Arabs early in the 8th century, and the feeble Christianity of the natives was supplanted by a vigorous and fanatical Mohammedanism. In 1510 it was taken by Don Pedro Navarro for Spain, and in 1523 it was assigned to the Knights of St. John, who had lately been expelled by the Ottoman Turks from their stronghold in the Island of Rhodes. The knights kept it with some trouble till 1551, when they were compelled to surrender to the Turkish admiral Sinan, and Tripoli henceforward joined in the general piracy which made the Barbary States the terror of maritime Christendom. In 1714 the ruling pasha, Ahmad Karamânlî, assumed the title of bey, and asserted a sort of semi-independence of the Sultan, and this order of things continued under the rule of his descendants, accompanied by the most brazen piracy and blackkmailing, till 1835, when the Porte took advantage of an intestinal struggle in Tripoli to reassert its authority. A new Turkish pasha, with viceregal powers, was appointed, and the state was made a vilâyet of the Ottoman empire, which it still remains. Several anti-Turkish rebellions have since taken place (notably in 1842 and 1844), but they have always been suppressed. The religious movement set on foot by the "prophet" Senûsi in the middle of the 19th century is the most remarkable feature in the history of Tripoli. The first Senûsi died in 1860, and was succeeded by his son, who calls himself the Mahdi, and commands the devotion of a large following in Northern Africa, much as did the better-known Mahdi in the Sudan. Of late Italy has sought to extend her interests in Tripoli. Pop. estimated at over 1,000,000.

**Tripoli,** probably the Œa of antiquity, called in Arabia Tarâbulus, or Tarâbulus Gharb ("Tripoli of the West"), the capital of the province of the same name; lies on the edge of the desert, on a point of rocky land projecting into the Mediterranean and forming a bay. It is a typical Moorish city irregularly built, surrounded by high bastioned walls and celebrated for its beautiful gardens. There are many mosques, besides several large churches. Though the majority of the inhabitants are Moslems, nearly all the trade is in the hands of Jews and Christians. Pop. about 40,000.

**Tripoli.** See ROTTEN STONE.

**Tripolitan War,** a war between the United States and Tripoli in 1801–1805. It was caused by the refusal of the United States to increase its payment for immunity from the depredations of the Tripolitan corsairs. After several conflicts by sea and land, peace was concluded June 4, 1805.

**Tripolitza,** a town of Southern Greece, in the province of Arcadia. Previous to the revolution it was the capital of Morea, but Ibrahim Pasha took possession of it in 1828 and razed it to the ground. It has since been rebuilt. Pop. 10,465.

**Tripp, Bartlett,** an American diplomatist; born in Maine, about 1842; was graduated at Colby University in 1861, and at the Albany Law School in 1866; removed to Yankton, S. D., in 1869, and there engaged in law practice. He was president of the First Constitutional Convention in 1883; chief justice of the Supreme Court of Dakota Territory in 1885–1889; minister to Austria in 1893–1897; and chairman of the commission of 1899 which arranged a settlement of the questions between the United States, England, and Germany, concerning SAMOA (*q. v.*).

**Tripp, Seth D.,** an American inventor; born in Rochester, Mass., in 1826. He invented a machine for pegging shoes in 1846, and also sole molders, rolling machines, heel polishers, shank cutters, beating-out and welt-cutting machines, and sole dyers. He died in Lynn, Mass., Jan. 7, 1898.

**Trippant,** in heraldry, a term applied to beasts of chase, as passant is to beasts of prey, etc. The animal is represented with the right foot lifted up, and the other three, as it were, on the ground, as if trotting. Counter trippant is when two animals are borne trippant contraryways, as if passing each other out of the field.

TRIPPANT.

**Trippkeite** (after Dr. Paul Trippke, the mineralogist), a mineral of uncertain chemical composition, occurring in small, brilliant crystals with olivenite, in cavities in cuprite, at Copiapo, Chile. Crystallization, tetragonal; color, bluish green. A qualitative examination showed that it was essentially an arsenite of copper, with the suggested formula ($n$CuO, $As_2O_3$); but, in the opinion of E. S. Dana, it probably requires a further chemical investigation.

**Tripsacum,** in botany, a genus of *Rottboelleæ*, from the warmer parts of North America. Spikes solitary or three together, the upper male, the lower female; male glume two-flowered, female one-flowered. *T. dactyloides*, the buffalo grass of the United States and the gama grass of Mexico, is highly valued as fodder.

**Tripterygium,** in ichthyology, a genus of *Blenniidæ*, with numerous species from tropical seas, the Mediterranean, Australia, and New Zealand. There are three distinct dorsal fins, the two anterior spinous.

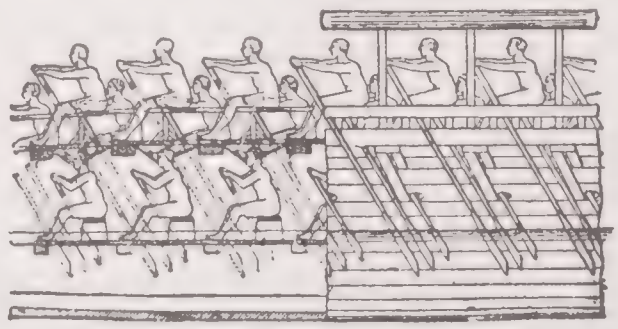
**Triptilion,** in botany, a genus of *Nassavieæ*; pretty annual Composites, sometimes cultivated in gardens. They are used in South America, on account of their dryness, as everlasting flowers.

**Triptolemæa** (named after Triptolemos, an Eleusinian, who spread the worship of Demeter, and was said to have invented the plow), in botany, an old genus of *Dalbergieæ*, reduced by Bentham to a sub-genus of *Dalbergia*. Known species three, all from Brazil. Trees or woody climbers, with unequally-pinnate leaves. The species were formerly believed to yield the rosewood of commerce. Now the greater part of it is known to come from *D. nigra*.

**Triptolemus,** in mythology, the son of Celeus, King of Attica, by Neæra. The goddess Ceres wished to make him immortal, but was prevented through the meddling curiosity of his mother. She, however, taught him agriculture, and rendered him serviceable to mankind by instructing him how to sow corn and make bread. She also gave him her chariot, drawn by two dragons, in which he traveled over the earth, and distributed corn to all the inhabitants of the world.

**Triptych** (trip'tik), a writing tablet in three parts, two of which might be folded over the middle part; hence sometimes an ecclesiastical register of names on a triple tablet, or a book or treatise in three parts or sections. Also a picture, carving, or other representation, generally on panel, with two hanging doors or leaves, by which it could be closed in front. Triptychs were constructed of various materials and dimensions; ivory and enameled triptychs were adorned with sacred subjects and emblems. They were frequently used for altar pieces. The central figure is usually complete in itself. The subsidiary designs on either side of it are smaller, and frequently correspond in size and shape to one-half of the principal picture.

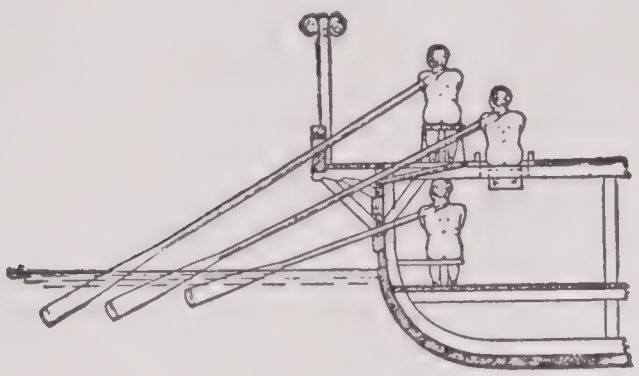
**Trireme,** in classical antiquity, a galley or vessel having three ranks or benches of oars on each side, a common class of war



TRIREME: ROWERS IN ACTION.

ship among the ancient Romans, Greeks, Carthaginians, etc. They were also provided with large square sails, which could be raised during a fair wind, to relieve the rowers. When two ships engaged, if tolerably well matched, the great object aimed at by each was, either by running up suddenly alongside of the enemy, to sweep away

or disable a large number of his oars, or, by bearing down at speed, to drive the beak full into his side or quarter, in which case the planks were generally stove in, and the vessel went down. But if one of the parties



TRIREME: POSITION OF ROWERS.

was so decidedly inferior in seamanship as to be unable to cope with his antagonist in such maneuvers, he endeavored, as he approached, to grapple with him, and then the result was decided, as on land, by the numbers and bravery of the combatants.

**Trisacramentarian,** in Church history, a controversial name given to those reformers who maintained that the sacraments of Baptism, the Lord's Supper, and Penance were necessary to salvation. This opinion was held by some Lutherans at Leipsic, and was advocated in England in the "Institution of a Christian Man," published in 1536.

**Trisagion,** one of the doxologies of the Eastern Church, repeated in the form of versicle and responses by the choir in certain parts of the liturgy, and so called from the triple recurrence in it of the word *hagios* = holy.

**Triscilidæ,** in Church history, a sect of Sabellian heretics, mentioned by St. Augustine as maintaining the opinion that the divine nature is composed of three parts, one of which is named the Father, the second the Son, and the third the Holy Ghost; and that the union of these parts constitutes the Trinity.

**Trismus, Nascentium,** the tetanus of new-born children, a malady which is now seldom met with except in certain localities where it appears to be endemic. Trismus nascentium is said to be common among negro children in the Southern United States, and it has been and still is common in the island of St. Kilda. At Westmannö, a small islet off the coast of Iceland, 64 per cent. of the infants born die of it between the 5th and 12th day from birth. About 1795, every sixth child born in the Dublin Lying-in Hospital died within a fortnight after birth, and trismus nascentium was the cause of the death of nineteen-twentieths of these children. Dr. Joseph Clark adopted means to secure the efficient ventilation of the hospital, and the mortality of the children fell at once to 1 in 19 1-3; and from 1826 to 1833 the mortality was only 1 in 58½; and but little more than the ninth part of that mortality depended on trismus nascentium. The disease seems to depend, essentially, on defective hygienic conditions in the dwelling, dirt and defective ventilation being common to the inhabitants wherever the disease prevails. Trismus nascentium generally terminates fatally within 36, often within 24, hours from the appearance of the first symptoms. See TETANUS.

**Tristan,** or **Tristram,** the center figure of a circle of old Celtic myths, which with countless modifications and additions afterward appeared in all the chief European literatures. According to the story, Tristan, son of Rouland Rise, Lord of Ermonie, and Blanche Fleur, sister of Mark, King of Cornwall, was sent by his uncle to woo vicariously and bring home as bride to the British king the fair Isolt, Yseult, or Ysonde, princess of Ireland. Tristan does so, but they unfortunately partake of a love charm which is not intended for them. They fall passionately but hopelessly in love with each other. The intrigue was carried on for years, and the story narrates the adventures — grave and gay — which resulted from the somewhat difficult position of the actors. They died simultaneously, and the king generously allowed them to be buried side by side. But "even in our ashes live their wonted fires," a vine and a rose-bush grew from the graves, and, meeting, twined amorously their branches together. The most important romance extant on the subject is that composed about 1170 by the Norman-English chevalier, Luce de Gast. The legend got abroad to France, and from thence mixed with the Arthurian myths to Germany, where Gottfried of Strassburg renarrated part of the story in a lively poem (1210), which had great popularity in the Middle Ages. Hans Sachs is one among a host of old writers who have treated the subject. The Auchinleck MS. of "Sir Tristan" was published by Walter Scott in 1806.

**Tristan D'Acunha** (dä-kön'yä), the largest of three islands in the South Atlantic (the others being Nightingale and Inaccessible Island), about 1,300 miles S. W. of St. Helena. It is mountainous, and one peak rises to the height of 7,640 feet. The island was taken possession of by Great Britain in 1817.

**Trisplanchnic,** in anatomy, of or belonging to the sympathetic nerve, which distributes its branches to the organs in the three great splanchnic cavities, the head, the chest, and the abdomen.

**Tristania,** in botany, a genus of *Leptospermeæ.* Leaves linear; flowers yellow;

petals five; stamens in five parcels. Australian shrubs, sometimes cultivated in greenhouses.

**Tristemma,** a genus of *Melastomeæ.* tropical African shrubs, with quadrangular stems, involucrate heads of flowers, and a four or five-celled, baccate fruit. The berries of *T. virusanum* are given in the Mauritius as a remedy for syphilis.

**Tristichous,** in botany, arranged on the stem in three vertical rows; used of arrangement or phyllotaxis of leaves on the stems of grasses. If measurement be made from any leaf one-third round the stem, a second leaf is just above the point reached; if another third be measured, there will be a third leaf above; and, if the remaining third be measured, there will be a fourth leaf just above the first. Thus, when there are a sufficient number of leaves to show the phyllotaxis, they will be found to be inserted, as defined, in three vertical rows.

**Tristoma,** in zoölogy, the typical genus of *Tristomidæ.* Body consisting of a broad and flat disk, having behind its inferior face a large cartilaginous sucker. *T. coccineum,* a species of an inch or more in breadth, and of a lively red color, is attached to the gills of many fishes in the Mediterranean.

**Tristomidæ,** in zoölogy, a family of *Trematoda,* furnished with three suckers, two small ones at the anterior extremity, with the mouth between them, and a larger one at the posterior extremity. They are chiefly parasitic on the gills of fishes.

**Trisula,** an ornament very commonly occurring in old Buddhist sculpture, on old coins, etc. Its meaning is not ascertained. According to Rémusat and General Cunningham, it represents the five elements of the material universe.

**Tritheism,** the doctrine which teaches that there are three Gods, instead of three Persons in the Godhead. According to Cyril of Jerusalem this teaching was introduced by the gnostics in the 2d century. In the 6th century a philosophic doctrine of Tritheism was formulated by Ascusnages, of Constantinople, who was banished for his heresy by Justinian. The opinions of Ascusnages were adopted by one of his pupils, Philoponus, who founded a sect called after him. With Philoponus was associated for many years a bishop of Tarsus, named Conon, who differed from his friend on the subject of the resurrection, and like him founded a sect, the Cononites. Tritheism was revived by Roscellinus, in the 11th century, who taught that the name God was the abstract idea of a genus containing the three Persons, the Father, the Son, and the Holy Ghost. He was opposed by St. Anselm in his treatise on "The Trinity," and condemned by the Council of Soissons (A. D. 1092), where he recanted. In 1691 the heresy was again revived. Dr. Sherlock, Dean of St. Paul's, London, published "A Vindication of the Doctrine of the Holy and Everblessed Trinity," in which he maintained that "there are three infinite distinct minds and substances in the Trinity," and that "the Three Persons in the Trinity are three distinct infinite minds or substances." Dr. South opposed the dean, and a long controversy ensued. In 1695, in a sermon before the University of Oxford, England, the preacher maintained the theory of Dr. Sherlock, which was condemned by the heads of houses as "false, impious, and heretical." A controversy followed of so serious a character that it was suppressed by an Order in Council, and measures were taken to stop the publication of Antitrinitarian books, which had been issued in great numbers during the controversy.

**Triticum,** in botany, wheat, wheat grass; a genus of *Hordeæ* or *Hordeaceæ*; spikelets solitary, sessile, distichous, compressed; the sides, not the backs, of the glumes and florets, directed to the rachis, many-flowered; empty glumes, two, unequal, shorter than the flowering glumes; flowering glumes herbaceous, rigid, many-nerved or without nerves; palea with ciliate nerves; scales ovate, entire, ciliate; stigmas subsessile; ovary hairy at the top; fruit grooved. The known and classified species number 20, from temperate regions. Some species are annual, others perennial. Many botanists limit the genus *Triticum* to the first section, calling the second *Agropyrum.* The three species wild in the N. parts of Europe and America all belong to the latter division. They are *T. caninum,* the fibrous-rooted wheat grass; *T. repens,* the creeping wheat grass or couch grass; and *T. junceum,* the rushy sea wheat grass. The first has the root fibrous, no stolons; the empty glumes three to five-ribbed, and the flowering glumes two to five awned. It is one to three feet high, is frequent in woods and banks, and flowers in July. It is widely distributed abroad. *T. junceum* has large shining spikelets, the empty glumes with 5 to 11 ribs, the flowering glumes with 5 to 10. It is found on sandy seashores, flowering in July and August. Sir J. Hooker includes under it two sub-species, *T. acutum* and *T. pungens.* The creeping roots of *T. repens, T. junceum,* and *T. glaucum* have been used as a substitute for sarsaparilla. *T. vulgare* is WHEAT (*q. v*).

**Tritoma,** the flame flower, a genus of tufted herbaceous plants belonging to the natural order *Liliaceæ.* The leaves are all radical, long, narrow linear; the flowers are scarlet and yellow, very showy, densely racemose or spicate, the spikes in some species being ovoid, supported at the summit of a stout leafless scape. The perianth is tubular, six-parted, usually more or less

depressed. The genus is best known in gardens by the name here given, but bears many synonyms, the earliest of which, *Kniphofia*, has been revived by botanists. There are about 16 species, natives of South Africa and Madagascar. The species best known in British gardens is *T. aloides*, better known as *T. uvaria*, which is quite hardy in Great Britain, and is one of the most brilliant of border flowers in late summer and autumn. There are four or five other species in cultivation less hardy, but hardly less showy, where they may be successfully grown. Light, rich, well-drained soil suits them best; they are propagated by division of the crowns in spring as growth commences.

**Triton,** in classical mythology, a powerful sea deity, son of Poseidon (Neptune) by Amphitrite, or, according to some, by Sileno or Salacia. He dwelt with his father in a golden palace on the bottom of the sea. He could calm the ocean, and abate storms. He was generally represented as blowing a shell, and with a body above the waist like that of a man, and below like a dolphin. Many of the sea deities were called Tritons by the poets.

**Triton,** in zoölogy: (1) A genus of *Salamandrinæ*, with 16 species, widely distributed in temperate and sub-tropical regions. Body covered with warty tubercles, four toes on anterior, and five on posterior limbs, all without nails; no parotids; glandular pores above and behind the eyes, and a series of similar pores arranged longitudinally on each side of the body; male with well-marked discontinuous crest on back and tail; tongue globular, partially free at the sides, free behind where it is pointed. In North America, *Diemictylus viridescens* is one of the most common species.

(2) A genus of *Muricidæ* (Woodward), according to some other authorities, of *Cassididæ*, with 100 recent species, from the West Indies, Mediterranean, Africa, India, China, the Pacific, and Western Australia, ranging from low water to 10 or 20 fathoms, and one minute species has been dredged at 50 fathoms. The Great Triton (*T. tritonis*) is the conch blown as a trumpet by the Australian and Polynesian natives. Fossil species 45, from the Eocene of Great Britain, France, and Chile.

**Tritonia,** in botany, a genus of *Iridaceæ;* about 25 species, all from Southern Africa; are cultivated in green houses; they have yellow, orange, pink, red, blue, or greenish flowers, and are handsome when in bloom. In zoölogy, the type genus of *Tritoniadæ*, with 13 species, from Norway and Great Britain; found under stones at low water to 25 fathoms. Animal elongated; tentacles with branched filaments; veil tuberculated or digitated; gills in a single series; mouth with horny jaws, stomach simple.

**Tritoniadæ,** or **Tritonidæ,** in zoölogy, a genus of *Tectibranchiata*, with nine genera (Woodward), to which Tate adds another, *Hero*. Animal with laminated, plumose, or papilose gills, arranged along the sides of the back; tentacles retractile into sheaths, lingual membrane with one central and numerous lateral teeth; orifices on the right side.

**Tritonidæ,** a family of marine nudibranchiate, gasteropodous mollusks, many of which are found on the coasts of England, France, and other European countries.

**Tritoxide,** a term formerly used to denote the third in a series of oxides, the first and second terms of which were called protoxide and deutoxide.

**Tritylodon,** a genus of mammals, with one species, *T. longævus*, founded on remains transmitted by Dr. Exton from beds of Triassic (?) age in Thaba-chou, in Basutoland, and described by Sir Richard Owen. Dentition: I. 2 — 2, M. 6 — 6. Its nearest allies are *Microlestes, and Stereognathus.*

**Triumfetta** (named after John Triumfetti, an Italian botanist and author), a genus of *Grewidæ;* annuals or perennials with stellate hairs. Leaves entire or palmately lobed; flowers solitary or in axillary clusters, yellow; stamens 10, rarely five; fruit prickly, two to five celled. The fruit of *T. annua* is called in Jamaica the parrakeet bur, because parrakeets feed on them. In India they eat this and *T. pilosa*, while in times of scarcity *T. rhomboidea*, a third Indian species, is eaten by men. *T. angulata* has a soft and glossy fiber.

**Triumph,** in Roman antiquities, a grand procession, in which a victorious general entered the city by the Porta Triumphalis, in a chariot drawn by four horses, wearing a dress of extraordinary splendor, namely, an embroidered robe, an under garment flowered with palm leaves, and a wreath of laurel round his brows. He was preceded by the prisoners taken in the war, the spoils of the cities captured, and pictures of the regions subdued. He was followed by his troops; and, after passing along the Via Sacra and through the Forum, ascended to the capitol, where he offered a bull in sacrifice to Jove. A regular triumph could not be demanded unless the following conditions had been satisfied:

(1) The claimant must have held the office of dictator, consul, or prætor.

(2) The success on which the claim was founded must have been achieved by the claimant while Commander-in-Chief of the victorious army; or, in other words, the operations must have been performed under his auspicia.

(3) The campaign must have been brought to a termination, and the country reduced to such a state of tranquillity as to admit of the withdrawal of the troops, whose presence at the ceremony was indispensable.

(4) Not less than 5,000 of the enemy must have fallen in one engagement.

(5) Some positive advantage and extension of dominion must have been gained, not merely a disaster retrieved, or an attack repulsed.
(6) The contest must have been against a foreign foe.

Under the empire, the prince being sole Commander-in-Chief of the armies of the State, all other military commanders were regarded merely as his legati, and it was held that all victories were gained under his auspicia, however distant he might be from the scene of action; consequently he alone was entitled to a triumph.

A naval triumph differed from a military one only in being on a smaller scale, and in being characterized by the exhibition of nautical trophies, such as beaks of ships. An ovation was an honor inferior to a triumph, the chief difference being that in the former the victorious general entered the city on foot, and in later times on horseback. The Senate claimed the exclusive prerogative of granting or refusing a triumph.

**Triumphal Arch.** See ARCH, TRIUMPHAL.

**Triumvir,** in Roman government, one of the three men united in office. The triumvirs were either ordinary magistrates (as the triumviri capitales, who were police commissioners, having charge of the jails, and acting as magistrates, the triumviri monetales, who were commissioners of the mint, and had the charge of coining money), or they were extraordinary commissioners appointed to jointly execute any office. The term is specifically applied to the members of the two triumvirates.

**Triumvirate,** a coalition of three men in office or authority; specifically applied to two great coalitions of the three most powerful individuals in the Roman empire for the time being. The first of these was effected in the year 60 B. C., between Julius Cæsar, Pompey, and Crassus, who pledged themselves to support each other with all their influence. This coalition was broken by the fall of Crassus at Carrhæ in Mesopotamia; soon after which the civil war broke out, which ended in the death of Pompey, and establishment of Julius Cæsar as perpetual dictator. After his murder, 44 B. C., the civil war again broke out; and after the battle of Mutina, 43 B. C., Antony, Octavius, and Lepidus coalesced, thus forming the second triumvirate. They divided the provinces of the empire; Octavius taking the West, Lepidus Italy, and Antony the East.

**Triuridaceæ,** in botany, triurids; an order of *Hydrales;* little perennial sub-hyaline plants, with a creeping rhizome. Stem simple, erect, cellular; leaflets minute, alternate, destitute of nervures; inflorescence in terminal racemes, flowers minute, generally unisexual; perianth hyaline, with a tube and limb, the latter divided into three, four, six, or eight segments; stamens few, anthers quadrilocular; style sometimes lateral, smooth, or feathery; ovaries numerous, carpels many, drupaceous. From the hotter parts of South America, Java, Ceylon, and the Philippine Islands. Known genera five, species eight.

**Trivertebral,** consisting of three vertebræ; a term applied by Huxley to a bone in glyptodon, formed by the anchylosis of the last cervical and first two dorsal vertebræ, and articulating by a movable hinge-joint with the remaining dorsal vertebræ, which are likewise anchylosed to form a kind of "arched bridge of bone."

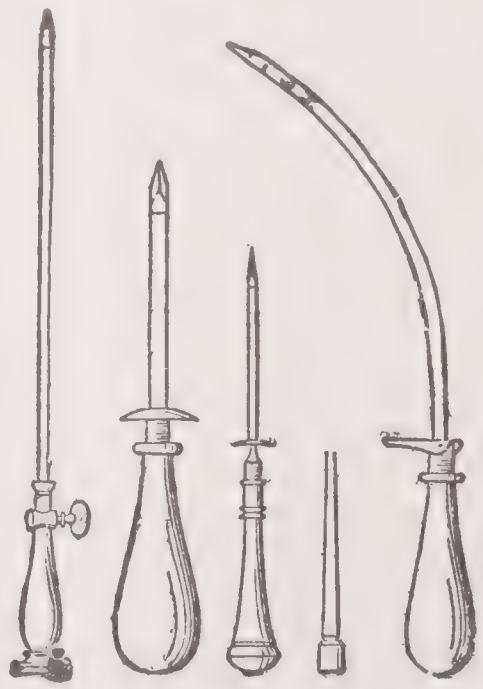
**Trivia,** in zoölogy, a sub-genus of *Cypræa,* with about 30 species, from Greenland, Great Britain, the West Indies, the Cape, Australia, the Pacific, and the W. coast of America. Small shells, with striæ extending over the back.

**Trivium,** the name given in the Middle Ages to the first three of the seven liberal arts — grammar, rhetoric, and logic. The other four, consisting of arithmetic, music, geometry, and astronomy, were called the quadrivium.

**Trixago,** in botany, a genus of *Euphrasieæ,* akin to Bartsia, but with a fishy, oval, globose capsule, and a thick trifid placenta. *T. viscosa* is the same as *Bartsia viscosa.*

**Trixis,** the typical genus of *Trixideæ.* Two species are cultivated either in gardens, or conservatories. *T. brasiliensis* is given as a remedy for excessive menstruation.

**Trocar,** or **Trochar,** in surgery, an instrument consisting of a perforator or stylet and a cannula.



TROCARS.

**Trocha,** a Spanish word denoting a military highroad. The trocha played an important part as a barrier in the Cuban insurrection of 1895–1898. It consisted of a cleared space 150 to 200 yards wide,

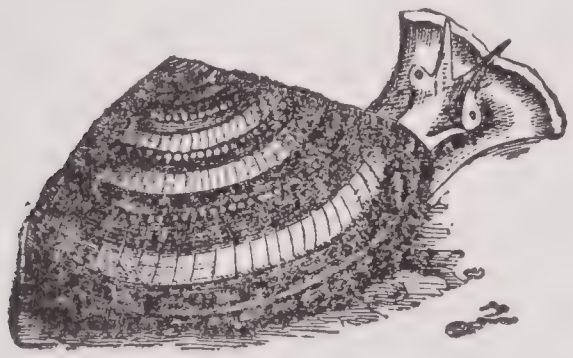
stretching through an apparently impassable jungle for 50 miles, bordered by fallen trees and a maze of barbed wire. Through the center of the clearing ran a single track military railroad, and on one side of that a line of forts.

**Trochatella,** in zoölogy, a sub-genus of *Helicina,* with the peristome simple, expanded, and the shell not callous beneath; known species, 20 from the West Indies and one from Venezuela.

**Trochetia** (named after M. du Trochet, a French physiologist), in botany, a genus of *Dombeyeæ.* Leaves entire; calyx five-parted; petals five, deciduous; stamens many, combined below into a tube; capsule five-valved, five-celled. *T. grandiflora,* a native of Mauritius, is a splendid stove plant with snow-white flowers.

**Trochee,** in prosody, a foot of two syllables, the first long and the second short, as Latin *fama,* or English nation.

**Trochidæ,** a family of gasteropodous mollusks of the order *Pectinibranchiata.* The shell is conical and spiral and more or



TROCHUS.

less nacreous; the aperture is entire and closed by a thin horny operculum. In the genus *Trochus* the shells are top-shaped, and hence are popularly known as topshells. Many of the shells are extremely beautiful, and are used for adorning head dresses, necklaces, etc., the outer layers being removed. There are a large number of British species, and a multitude of foreign and fossil forms. The *Trochidæ* are closely allied to the *Turbinidæ.*

**Trochilidæ,** the humming birds, a family of insessorial birds, containing above 300 species, divided into about 75 genera or subgenera. The trochilidæ include some of the smallest known birds, many of which are remarkable for the wonderful splendor of their plumage. In this one respect alone, neither pen nor pencil could convey any adequate idea of their dazzling luster. They are active little birds, and from the structure of their frames, it is apparent that they were intended to pass most of their time on the wing. Their food consists of small insects, and perhaps the nectareous juices of flowers, which their tongue is beautifully fashioned for obtaining. This organ is very long, and can be darted out of the bill to a considerable length, by a sudden motion, like that of a spring. Their feet are small, generally dark-colored. Their wings are very long and narrow, and they are, by means of the rapid motion given to them, able to balance themselves in the air, hovering round flowering shrubs and plants, probing their tubular nectaries, and at the same time emitting a pretty loud humming noise, caused by the concussion of their wings with the air; whence their English name "humming birds." The trochilidæ are very pugnacious little creatures, and defend their nests with the greatest courage against all intruders, even man himself. They are natives of America, and are found from one extent of the continent to the other, though in greatest numbers in the tropical parts, in the deltas, and along the banks of the great rivers both of the North and South. *Mellisuga humilis,* a species peculiar to the West Indies, has a very sweet note, and is perhaps the only species of the family that has a real song. The male bird of this variety is about 2½ inches in length, and is exactly like an humble bee when darting about in the air. The nests of the humming birds are wonderfully made, with cotton, wool, and twigs, beautifully interwoven with feathers, and lined with down; and almost all the species lay two eggs, which in some cases are extraordinarily small. The smallest species of all is the *Mellisuga minima,* which is only about one inch and a quarter in length, and which weighs but 20 grains.

**Trochilium,** in entomology, the clearwing; a genus of *Ægeriidæ.* Antennæ simple, or in the males ciliated or pectinated, terminating in a slender tuft of hairs; fore wings generally with the basal half transparent; hind wings wholly transparent. Abdomen slender, with an anal tuft. The caterpillar feeds within the stems of currant bushes, the birch, the oak, the apple, various willows, etc. The species present a superficial resemblance to insects of other orders, and one is called *T. cynipiforme,* another *T. tipuliforme,* a third *T. culiciforme,* etc. The second species is that most common in gardens; it is the currant hawk-moth.

**Trochilus,** in ornithology: (1) The type genus of *Trochilidæ.* Tail-feathers pointed, wings short; plumage not very brilliant, except on the throat. Two species are known — *T. colubris,* inhabiting North America during the summer, and migrating in winter to Central America and the West India islands; and *T. alexandri,* from California and Mexico. (2) *Charadrius melanocephalus,* a native of Egypt. It is about 10 inches long; general hue slate color; abdomen and neck white, head black, with two

white stripes running from the bill and meeting at the nape of the neck, black mantle extending over the shoulders to the tail, wings black, with a broad transverse black band.

**Trochocarpa,** in botany, a genus of *Styphelieæ;* Australian shrubs or small trees, with terminal or axillary spikes of white or yellow flowers. *T. laurina* is a very handsome greenhouse shrub.

**Trochoceras,** in palæontology, a genus of *Nautilidæ,* with 44 species, from the Upper Silurian of Bohemia. Shell nautiloid, spiral, depressed; some of the species are nearly flat, and, having the last chamber produced, resemble *Lituites.*

**Trochocyathaceæ,** in palæontology, a sub-family of *Turbinolidæ;* corals, with more than one row of pali, and with an abnormally large number of rows of tentacles. Largely represented in the Newer Secondary rocks and in the Tertiary, and at present in the deep sea.

**Trochu** (trō-shü′), **Louis Jules,** a French military officer; born in Le Palais, France, March 12, 1815; was educated at St. Cyr; engaged in the Algerian, Crimean, and Italian campaigns; published a pamphlet entitled "The French Army in 1867," and showed the weakness of the French army, by which he forfeited the favor of Napoleon. At the outbreak of the Franco-Prussian War (1870), however, he was made Governor of Paris, and when the republic was proclaimed he was intrusted with the defense of the city, a position which he held till the capitulation. He was elected to the National Assembly in 1871 and retired to private life in 1873. He wrote: "For Truth and Justice" (1873); "Politics and the Siege of Paris," and "The French Army in 1879." He died Oct. 7, 1896.

**Trochosmiliaceæ,** in palæontology, a sub-family of *Astræidæ;* solitary corals, cup-shaped, and with the internal dissepiments well developed.

**Trochotoma,** in palæontology, a genus of *Haliotidæ,* with 10 species, from the Lias to the Coral Rag of Great Britain, France, etc. Shell trochiform, slightly concave beneath; whorls flat, spirally striated, rounded at the outer angles; lip with a single perforation near the margin.

**Trochus,** in zoölogy, a genus of *Turbinidæ,* with 200 species, universally distributed, from low water to 15 fathoms, the smaller species range nearly to 100 fathoms. Shell pyramidal, with a nearly flat base; whorls numerous, flat, variously striated; aperture oblique, rhombic, pearly inside; columella twisted, slightly truncated; outer lip thin; operculum horny, multispiral. Woodward enumerates 10 sub-genera, to which Tate adds some others. Fossil species 361, from the Devonian onward. Found in Europe, North America, and Chile.

**Troegerite,** a mineral occurring in thin, tabular crystals, with walpurgite and other minerals, at the Weisser Hirsch mine. Schneeberg, Saxony. Crystallization, monoclinic; color, lemon-yellow. Composition: A hydrated arsenate of uranium; formula, $5U_2O_3$, $2AsO_5 + 20HO$.

**Trœzen,** a very ancient Greek city, capital of the S. E. district of Argolis. It was the birthplace of Theseus (*q. v.*).

COIN OF TRŒZEN.

**Troginæ,** in entomology, a sub-family of *Scarabeidæ,* resembling the *Geotrupinæ* in the form of the head, but the legs are not adapted for burrowing. They feed on animal substance on the surface of the ground or on trees. Those which frequent the former situation are colored like the sandy soil, and often coated with sand. The others are frequently metallic, and can roll themselves up like a ball.

**Troglodyte.** See Cave Dwellers.

**Troglodytes,** in ornithology, the wren; a genus of *Troglodytidæ* or *Troglodytinæ,* from the Neotropical, Nearctic and Palæarctic regions. Bill moderate, compressed, slightly curved, without notch, pointed; nostrils basal, oval, partly covered by a membrane; wings very short, concave, rounded; tail generally short; feet strong, middle toe united at base to outer, but not to middle toe; tarsus rather long; claws long, stout, and curved.

In zoölogy a genus of *Simiinæ.* Head not produced vertically; arms not reaching more than half down the shin; ribs 13 pairs; os inter-medium absent from the carpus; no ischiatic callosities; hair black, dun, or gray. The genus is confined to the West African sub-region, ranging from the coast about 12° N. and S. of the equator, from the Gambia to Benguela, and as far inland as the great equatorial forests extend. The number of species is not accurately determined; three, however, are well known, and have been carefully described: *T. gorilla,* the gorilla; *T. niger,* the common, and *T. calvus,* the bald chimpanzee. There are probably other species, since Livingstone met with what he supposed to be a new species in the forest region W. of the Nile, and another has been described by Gratiolet and Alix.

**Troglodytidæ,** in ornithology, the wrens, a family of *Passerine* birds with 17 genera and 94 species. They are rather abundant and varied in the Neotropical region, with a few species scattered through the Nearctic, Palæarctic, and parts of the

Oriental region. The constitution of the family is by no means well determined.

**Troglodytinæ,** a sub-family of *Timaliidæ,* distinguished by the bill being long and curved, short in proportion to the body.

**Trogon,** in ornithology, the type family of *Trogonidæ,* with 24 species, ranging from Paraguay to Mexico, and W. of the Andes in Ecuador. Also any individual of the genus *Trogon,* or the family *Trogonidæ.* In palæontology, remains of the *Trogonidæ* have been found in the Miocene of France. At that exceptionally mild period in the Northern Hemisphere these birds may have ranged over all Europe and North America; but as the climate became more severe they were gradually restricted to the tropical regions, where alone a sufficiency of fruit and insect food is found all the year round.

**Trogonidæ,** in ornithology, a family of picarian birds, with seven genera and 44 species. They are tolerably abundant in the Neotropical and Oriental regions; and are represented in Africa by a single genus: bill short, strong, with a wide gape; tail generally long and in some species very long; feet small and often feathered almost to the toes, two of which are placed in front and two behind. They form a well-marked family of insectivorous forest-haunting birds of small size, whose dense, puffy plumage exhibits the most exquisite tints of pink, crimson, orange, brown, or metallic green, often relieved by delicate bands of pure white. In one Guatemalan species, *Pharomacrus mocinno,* the long-tailed trogon or quesal, the tail coverts are enormously lengthened into waving plumes of rich metallic green, as graceful and marvelous as those of the birds of paradise. Trogons are unable to use their feet for climbing, and usually take their station on the branches of a tree, dashing on insects as they fly past, or on some fruit at a little distance from them, and returning to their seat to eat what they have secured.

**Trogosita,** in entomology, the typical genus of *Trogositidæ. T. mauritanica* is often found in meal bins, feeding on their contents.

**Trogositidæ,** a family of *Necrophaga,* or *Clavicornia.* Lower jaws with only one lobe, and the first joint of the tarsi reduced in size. They are long beetles, with the body compressed, often of metallic colors. About 150 are known, mostly feeding on wood.

**Trogosus,** in palæontology, a genus of *Tillotheridæ,* called by Leidy *Anchippodus.* Founded on remains from the Eocene of Wyoming.

**Trojan War, The,** a legendary war which forms the theme of the "Iliad" of Homer. The story briefly told is that Paris (Alexander), son of Priam, King of Troy, carried off Helen, wife of Menelaus, King of Sparta; that the Achæan princes, under the command of Menelaus' brother, Agamemnon, King of Mycenæ, undertook to recover Helen; that the Achæans, having besieged Troy for nine years, eventually sacked the city and recovered Helen. These events were regarded as historical not only by the Greeks themselves, but by the moderns as late as the first half of the 19th century, and a date (1184 B. C.) was assigned with as much precision and confidence to the fall of Troy as to the fall of man. But the remarkable revolution in the views of scholars about mythology, begun by Lobeck in 1829, and by the brothers Grimm, led to the belief that the war was legendary. Many of the incidents were shown to be myths common to most Indo-European nations at least. The account of which Homer left to us of the struggle to avenge the wrongs and woes of Helen is essentially a story in which the main chain of causation is superhuman, in which the gods mingle visibly with men, and the heroes themselves are the sons or husbands of immortal beings. The legend of Troy was a favorite subject with the poets of the Middle Ages and took varied forms differing from the Greek version of the event and dwelling on the heroes descended from the exiled Trojans. The excavations of Dr. Schliemann reawakened the question of a historical basis for the Trojan War. See SCHLIEMANN, HEINRICH: TROY.

**Trolleite,** an amorphous mineral, with compact texture; hardness, below 6.0; sp. gr., 3.10; luster, somewhat vitreous; color, pale green. Composition: Phosphoric acid, 47.8; alumina, 46.2; water, 6.0 = 100, corresponding with the formula, $Al_2O_3PO_5 + \frac{1}{3}Al_2O_3,3H_2O$. Found in an iron mine at Westana, Scania, Sweden.

**Trolley,** a word originating in England, applied at first to a handcart and afterward to a truck. In the United States, a trolley means a pulley running on an overhead wire. In electric railways this pulley is at the top of a long rod that acts as a conductor to transmit the electric current to the motor of a street car. By extension, the word trolley is applied to the car and to the system as a whole. See STREET RAILWAYS: TRAMWAY.

**Trolley Fire Engine,** a fire engine differing from those in ordinary use, merely by its being adapted to be carried on trucks fitted with motors that can run on a trolley line. The engine is raised to the trucks and lowered from them by jacks.

**Trollius,** the globe flower; a genus of *Helleboreæ.* Erect perennial herbs, with alternate palmately-lobed or cut sepals, 5

to 15, colored; petals 5 to 15, small, linear, flat, with a pit above the contracted base; stamens numerous, follicles five or more. Known species nine, from the North Temperate and Arctic zones.

**Trollope, Anthony,** an English novelist; born in London, England, April 12, 1815; a younger son of Frances M. Trollope. He was educated at Harrow and Winchester; in 1834 became a clerk in the postoffice, and in 1841 was appointed clerk to a postoffice surveyor in Ireland. His Irish experiences gave him material for his first novels, "The Macdermots of Ballycloran" (1847), and the "Kellys and the O'Kellys" (1848), neither of which was successful. His first success was "The Warden" (1855); followed by "Barchester Towers" (1857); "Dr. Thorne" (1858); "The Bertrams" (1859); "Framley Parsonage" (1861); "The Struggles of Brown, Jones, and Robinson" (1862); "Orley Farm" (1862); "The Last Chronicles of Barset" (1867); "Ralph the Heir" (1871); "The Way We Live Now" (1875); "The Prime Minister" (1876); "Marion Fay" (1882); "The Land-Leaguers" (1883); etc. He also published accounts of his travels, including "The West Indies and the Spanish Main" (1859); "Australia and New Zealand" (1873); "South Africa" (1878); besides a "Life of Cicero" (1881). He died in London, Dec. 6, 1882.

ANTHONY TROLLOPE.

**Trollope, Frances M.,** an English author; mother of Anthony; born near Bristol, England, in 1780. In 1829 she visited the United States, and afterward published a volume entitled "Domestic Manners of the Americans" (1831). She followed this with the novel "The Refugee in America" (1832). Among her other works are: "The Abbess" (1833); "Tremordyn Cliff" (1835); "The Barnabys in America" (1843); "Life and Adventures of a Clever Woman" (1854); and "Fashionable Life; or, Paris and London" (1856). She died in Florence, Italy, Oct. 6, 1863.

**Trollope, Thomas Adolphus,** elder brother of Anthony; born April 29, 1810. He was a constant contributor to English periodicals, and was Italian correspondent of the New York "Tribune." Among his many books are: "A Summer in Brittany" (1840); "A Summer in Western France" (1841); "La Beata" (1861); "Marietta" (1862); "Beppo the Conscript" (1864); "Lindisfarn Chase" (1864); "History of the Commonwealth of Florence" (4 vols. 1865); "Dream Numbers" (1868); "A Siren" (1870); "Life of Pius IX" (1877); "Sketches from French History" (1878); "What I Remember" (1887–1889). He died in Clifton, England, Nov. 11, 1892.

**Trombidides,** or **Trombidiides,** in zoology, harvest mites; an extensive family of *Acarina*. Body stout, round, or oval, often somewhat oblong, frequently broader before than behind; sometimes densely clothed with a kind of pubesence; the two hinder pairs of legs far removed from the two fore pairs; eyes two. They are generally of some shade of red, often bright vermillion, sometimes more or less spotted with brown or black. There are several genera, some of which feed on the juices of plants, others attack man and the lower animals.

**Trombidium,** in zoölogy, the type genus of *Trombidides*, with many species, some of which in their larval stages are parasitic. The genus *Leptus* is found on the larvæ of several species of *Trombidium*.

**Trombone,** a large, deep, and loud-toned instrument of the trumpet kind, the name being an augumentative of *tromba*, a trumpet. It consists of two tubes, so constructed that one may slide in and out of the other, and thus form one tube that can be lengthened at will and made of varying pitch. There are three kinds of trombones, called after their compass the alto, tenor, and bass trombones. Soprano trombones have also been made, but they are rarely used. The alto trombone has a compass of more than two octaves and a half, and is also known as the trombone in E flat. It is written in the C clef, third line. The tenor trombone is also known as the trombone in B flat. It is written on the C clef, fourth line. The bass trombone is the lowest of all in its range of notes, and is known as the E flat. It is written on the F clef; is an octave lower than the alto, and a fifth lower than the tenor. Some of these instruments are fitted with pistons, whence they are called valve trombones. Also a powerful reed stop in the organ, of 8 feet or 16 feet scale on the manuals and 16 feet or 32 feet on the pedals. In ordnance, a form of blunderbuss for boat service.

TENOR TROMBONE.

**Tromometer,** an instrument for measuring earth tremors. It usually consists of a pendulum or pendulums, with means for observing the oscillations on a micromatic scale.

**Tromp,** the water-blowing engine; used as a furnace blast in Savoy, Carniola, and some parts of America. Water from a reservoir flows through a pipe, which is contracted just below the reservoir to divide the stream into a shower, and has oblique perforations, through which air enters and is carried down by the water, which impinges on a plate in a drum, separating the air which is compressed in the upper part of the drum, flowing through a pipe to the blast pipes.

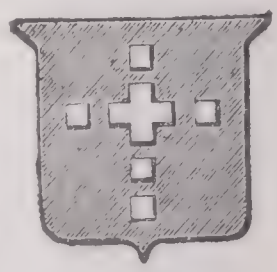
MARTIN VAN TROMP.

**Tromp, Marten Harpertzoon Van,** a Dutch naval officer; born in Briel, Holland, in 1597. He began to serve under his father in the navy at 10 years of age, gradually rose to distinction, and in 1637 attained the rank of lieutenant-admiral; in which capacity he served against the Spaniards, and captured many of their ships. In October, 1639, he won a great victory over the Spanish fleet and captured 13 galleons. He was engaged in the naval campaigns of 1640 and 1641; but his courage and abilities were most strikingly displayed in the war with England in 1652–1653. He had Robert Blake for his adversary, and was defeated off Dover in March, 1652. In November following, he, in his turn, defeated Blake, and sailed up the English Channel with a broom at his masthead. Another engagement took place in the channel, in February, 1653, when the Dutch lost many of their ships, but Tromp succeeded in saving the 300 merchant ships he was convoying. After commanding in several other battles against the English, this great seaman fell in the engagement with Monk, off the coast of Holland, Aug. 8, 1653. His son, CORNELIUS VAN TROMP, born in Rotterdam, Holland, Sept. 9, 1629, rose also to eminence as a naval commander, and, on De Ruyter's death, was appointed lieutenant-admiral-general of the United Provinces. He died in Amsterdam, May 29, 1691.

CORNELIUS VAN TROMP.

**Trona.** a sodium carbonate, $H_5Na_3C_2O_8$

**Tronconee Demembre,** in heraldry, said of a cross or other bearing cut in pieces and separated, though still reserving the form of the cross, or other bearing.



CROSS TRONCONEE.

**Trondhjem,** also THRONDHJEM, a port of Norway, on the S. side of the long and narrow Trondhjem fjord; at the mouth of the little Nid river; 250 miles N. of Christiania. It is built on undulating slopes, and has regular and broad streets, the houses being mostly of wood, though the building of new wooden houses is now forbidden by law. The (fortified) harbor is capacious, deep, and safe, but is difficult of entry. The most interesting building in the city is the venerable cathedral, a cruciform church dating partly from the 13th century, of English-Norman architecture, and unquestionably the most interesting ecclesiastical edifice in Norway. A great fire in 1530 destroyed most of the church except the richly adorned octagonal choir (late Gothic). The church, since 1818 the place of coronation of Norwegian kings, has been carefully restored since 1880. Portions of an old archiepiscopal palace (Kongsgaard) also survive. The

town is the main emporium of a wide district of country, and has a large trade by sea and land; the exports include copper ore, herrings and other fish, train oil, timber, etc. The ancient capital of Norway, originally called Nidaros, Trondhjem was founded in 996 by Olaf Trygvason, and became in 1152 the seat of an archbishop. Its decline dates from the Reformation. It was taken by the Swedes atter a siege of nine weeks, and has often been nearly destroyed by fire. Pop. (1900) 38,180.

**Troopial,** the name common to a group of passerine birds, akin to the orioles and starlings. They mostly inhabit the Southern United States, but several of them appear as birds of passage in the Northern States in early spring. The cow troopthers two-celled; style one; stigmas three to five; ovary one, three-cornered; three or five carpels; ovules solitary; fruit indehiscent; seeds large, without albumen, filling the cell in which they are. Known genera 5, species 43. All from the temperate parts of America. The order was formed by the elevation of the tribe *Tropæoleæ;* now most botanists are reverting to the old arrangement.

**Tropæolic Acid,** an acid extracted from the herb and seed of *Tropæolum majus,* by heating with alcohol. It crystallizes in slender needles, insoluble in water, soluble in alcohol and ether.

**Tropæolum,** in botany, the Indian cress, or nasturtium; the typical genus of *Tropæolaceæ;* calyx five-parted, the upper lobe

CATHEDRAL OF TRONDHJEM.

ial, cow bird, or cow bunting, the blue bird, and the bobolink or rice bunting, belong to this group.

**Troostite,** a variety of willemite, occurring in large opaque crystals, which are mostly impure from the presence of iron and manganese. Found with franklinite, etc., in the State of New Jersey.

**Tropæolaceæ,** Indian cresses; an order of hypogynous exogens, alliance Malvales; smooth, twisting or twining herbs of tender texture and acrid taste. Peduncles axillary, one-flowered. Sepals three to five, generally with valvate æstivation, the upper one with a long spur; petals normally five, yellow, scarlet, orange, rarely blue, sometimes reduced to two or even one, convolute in æstivation; stamens 6 to 10; anspurred, petals normally five, unequal, the three lowest small or wanting; stamens eight, free; carpels three, kidney-shaped; fruit roundish, furrowed, indehiscent, the seed large, filling the cell; climbing plants from South America. Those best known are *T. majus,* the great, and *T. minus,* the small, Indian cress or nasturtium. The leaves of the first are peltate, nerved, orbicular, somewhat lobed, the nerves not mucronate; petals obtuse. It was brought at first from Peru. The second species is smaller than the last, with peltate nerves, orbicular leaves, deep yellowish flowers, streaked with orange and red. The berries of both species are gathered when green and made into a pickle, and used also as a garnish for dishes. *T. tricolorum* is a high-

ly ornamental species, having the calyx wavy, scarlet, tipped with black, and the petals yellow. *T. canariense* is a climbing variety known as the Canary creeper. Of

CANARY CREEPER: TROPÆOLUM PEREGRINUM.

late years florists have succeeded in obtaining endless varieties of colors of *Tropæolum*.

**Trope,** in rhetoric, a term applied to a word or expression diverted from its original to a figurative signification, and thus including allegory, irony, metaphor, metonymy, synecdoche, etc.

**Trophi,** in entomology, the organs about the mouth in insects. These are of two types, the masticatory and the suctorial, which are sometimes modified and occasionally combined. The trophi of masticatory insects. such as beetles, consist of (1) an upper lip, or labrum; (2) a pair of mandibles, for biting; (3) a pair of maxillæ, for chewing; (4) a lower lip or labium. In the suctorial insects, such as the butterflies, the labrum and mandibles are rudimentary; the maxillæ are greatly elongated, and form a spiral trunk, or antlia, by which the juices of flowers are sucked up.



**Trophic Nerves,** in physiology, any nerves which either actually influence nutrition, or have been supposed to do so; as the fifth or trigeminal nerve, which has a certain influence on the nutrition of the eye.

**Trophimus,** a disciple of St. Paul, a Gentile, and an Ephesian by birth, who went to Corinth with the apostle, and accompanied him in his whole journey to Jerusalem, A. D. 58 (Acts xx: 4).

**Trophis,** in botany, a genus of *Artocarpaceæ*. Flowers diœcious, spike axillary, males with four stamens, females with a single ovule. Fruit succulent. Natives of both the East and West Indies. *T. americana*, the Ramoon tree, is about 20 feet high, and bears pleasantly flavored drupes about the size of grapes. It is a native of the West Indies, where the leaves and twigs are eaten by cattle. The milky juice of *T. asper*, a small evergreen Indian tree, is applied to cracked heels and sore hands. It is astringent and septic, and the bark, in decoction, is used as a lotion in fevers; the rough leaves are employed to polish wood. *T. spinosa* is another Indian species; its fruit is eaten in curries.

**Trophonius,** the fabled builder of the temple of Delphi, after his death was reverenced as a hero, and had a famous oracle in a cavern near Lebadeia in Bœotia. Pausanias describes how, after purifying himself, he was drawn through the mouth of this cave by an unseen power, and all that he witnessed there. Don Quixote's fancied visit to the oracle preserves its memory.

**Trophy,** a monument or memorial in commemoration of a victory. It consisted of some of the arms and other spoils of the vanquished enemy, hung upon the trunk of a tree or a pillar by the victors, either on the field of battle or in the capital of the conquered nation. If for a naval victory, it was erected on the nearest land. The trophies of the Greeks and Romans were decked out with the arms of the vanquished for land victories, with the beaks of the enemy's vessels for naval engagements. In modern times trophies have been erected in churches and other public buildings to commemorate a victory. Also, anything taken and preserved as a memorial of victory, as flags, standards, arms, and the like.

**Tropic,** in astronomy, one of the two small circles of the celestial sphere, situated on each side of the equator, at a distance of 23° 28′, and parallel to it, which the sun just reaches at its greatest declination N. or S., and from which it turns again toward the equator, the N. circle being called the Tropic of Cancer, and the S. the Tropic of Capricorn, from the names of the two signs at which they touch the ecliptic.

The stars are brighter in the tropics than in the temperate zones, and astronomical observation is easier. Cyclones arise within the tropics. The characteristic vegetation of the tropics consists of gigantic endogens, as palms, some of which rise to a height of from 100 to 200 feet. More polypetalous exogens are arborescent than in temperate climes. The *Coniferæ* exists chiefly on mountains. Ferns abound in tropical islands, and deltas where water is plentiful, so that in some localities from 250 to 300 species may be gathered. The tropical type of vegetation was separated at a remote period into two portions, one in the Old World, the other in the New. Shells are brighter than in lands where the sun is less powerful, the birds more numerous and of gayer plumage, the feline tribe larger and in greater numbers.

In geography, one of the two parallels of terrestrial latitude corresponding to the celestial tropics, being at the same distance from the terrestrial equator as the celestial tropics are from the celestial equator. The one N. of the equator is called the Tropic of Cancer and that S. of the equator the Tropic of Capricorn. Over these circles the sun is vertical when his declination is greatest, and they include that portion of the globe called the torrid zone, a zone about 47° wide, having the equator for a central line.

The regions lying between the tropic of Cancer and the tropic of Capricorn, or near them on either side, are called the tropics.

**Tropic Acid,** $C_9H_{10}O_3$; a monobasic acid, obtained by digesting atropine and belladonna with baryta water. It crystallizes in needles and plates slightly soluble in water, and melts at 117°.

**Tropic Bird,** a popular name for any species of the genus *Phaëton.* They are tropical sea birds, in habits and general appearance approaching gulls and terns, and resembling the latter in their mode of flight. Their powers of flight are great, and they are usually seen at considerable distances from the land, as they live almost entirely on the wing, and when they do not return to the distant shore to roost, rest on the surface of the water. They are about 30 inches long, of which the long tail feathers occupy about one-half. The general hue of the plumage is white; in two species, from the Atlantic Ocean, *P. aetherius* (or *candidus*) and *P. flavirostris,* the tail feathers are white; in the third species, *P. phœnicurus,* from the Pacific Ocean, they are red, and are highly valued by the natives of the South Seas as ornaments. Tropic birds nest in holes in cliffs and on rocky islands, the female laying only one egg, and the male sitting in a hole by her side, both with heads inward.

THE TROPIC BIRD.

**Tropidine,** $C_8H_{13}N$; an oil obtained by heating tropine with concentrated hydrochloric acid or with glacial acetic acid to 180°. It has the odor of conine, and boils at 162°.

**Tropidolepis,** in zoölogy, a genus of *Iguanidæ,* with 15 species, ranging over the greater part of tropical America and N. to California. Back not crested; throat with a fold on each side.

**Tropidolepisma,** in zoölogy, a genus of *Scincidæ,* with six species, peculiar to Australia. Tail elongate, round, tapering, armed; scales three or five keeled, slightly toothed behind.

**Tropidoleptus,** in palæontology, a genus of *Orthidæ,* separated from *Strophomena,* with two species from the Devonian of the United States.

**Tropidonotus,** a genus of colubrine snakes, sub-family *Natricinæ,* with numerous species, very widely distributed, absent only from South America; body stout to slender, tapering to head and tail, belly round; head distinct, crown flat, occipital tract broad, snout narrow; tail tapering to a point; eye moderately large, pupil round; teeth small; scales keeled, pointed, truncate, or emarginate.

**Tropidophora,** in zoölogy, the name given by Troschel to the species of *Cyclostoma,* which have the whorl spirally keeled. They are found in Madagascar and the adjacent islands and on the coast of Africa.

**Tropidophorus,** in zoölogy, a genus of *Scincidæ,* with two species from Cochin China and the Philippines. Tail with four spinous keels above, and its sides smooth. Pre-anal plates three, large; the central one triangular.

**Tropidorhynchus,** in ornithology, a genus of *Meliphagidæ,* with 18 species, ranging from Moluccas and Lombok to New Guinea, Australia, Tasmania and New Caledonia.

**Tropidosternus,** in entomology, a large genus of *Hydrophilidæ,* from North and

South America. Some are metallic, others with yellow stripes.

**Tropine,** $C_8H_{15}NO$; an organic base obtained by heating atropine with a saturated solution of baryta water, and precipitating the baryta with carbonic acid gas. It has a strong alkaline reaction, is soluble in water, alcohol, and ether, melts at 62°, and boils at 229°. From its ethereal solution it crystallizes in colorless anhydrous tables.

**Troppau,** the chief town and capital of Austrian Silesia; on the Oppa; 106 miles S. S. E. of Breslau. It is surrounded by fine gardens, replacing the old walls and intrenchments, and has three suburbs, six churches (one Evangelical), an old town hall (lately rebuilt in Gothic style), a large barrack, a higher gymnasium and realschule, a teachers' training college, a commercial school, and several benevolent institutions. Troppau manufactures cloth (chiefly military), machinery, beet sugar, beer, potash, sodawater, lucifers, spirits, liquors, and paper. Troppau was founded in the 13th century. From Oct. 20 to Dec. 20, 1820, a congress of representatives of the five great powers, afterward transferred to Laibach, met here to plan for suppressing revolutionary outbreaks in Italy. Pop. (1900) 26,748.

**Troppo,** in music, an Italian term for too much.

**Trossachs,** a romantic defile forming an approach to the W. Highlands of Scotland; in Perthshire, about 8 miles W. of Callander; extends for about a mile between Lochs Ackray and Katrine. The pass, which winds between Ben A'an on the N. and Ben Venue on the S., is confined by lofty rugged precipices, feathered to their summits with birch, pine, and other trees.

**Trotter, Newbold Hough,** an American artist; born in Philadelphia, Pa., Jan. 4, 1827; was graduated at Haverford College in 1845; engaged in mercantile business till 1858, when he applied himself to art. When the Civil War broke out he joined the Germantown Home Guards and took part in the battle of Antietam. After the war he practised his profession till his death. He was selected by the United States government to paint all the mammalia of North America to be issued by the government. Among his chief works are "After the Combat," "Grizzly Bears," "Wounded Buffaloes," "The Last Stand," and "Indian Encampment." His historic paintings include three pieces representing the progress of travel in Pennsylvania during 50 years. He died in Atlantic City, N. J., Feb. 21, 1898.

**Trotting Horse,** a horse trained to trot at high speed without breaking into a gallop. Trotting horses are of two distinct races: (1) The Russian, which is Arabian on a Flemish stock, attaining high speed, but with bad knee action; (2) the American, which is probably both Barb and Arabian on an English stock. Some of the fastest English trotting horses can cover a mile in three minutes, while American trotters have done the same distance in a few seconds over two minutes. The American trotting horse has been constantly increasing in speed, and what a few years ago was considered a wonderful performance is now looked on as commonplace. The history of the rise of the trotting horse — especially from the time of "Rarus" down to the days of "Nancy Hanks" — presents a constantly lower record of the time required to trot a mile. The names of individual American trotters are known all over the world, and the prices paid for some of them seem almost fabulous. The record for several years after the advent of "Maud S." remained stationary, but since has been eclipsed several times. "Nancy Hanks" trotted a mile, against time, in two minutes and four seconds, harnessed to a pneumatic sulky weighing 62½ pounds, and accompanied by a running horse, on the regulation track, Terre Haute, Ind., Sept. 28, 1892. "Alix," in harness, trotted a mile against time in two minutes and three and three-fourths seconds, at Galesburg, Ill., Sept. 19, 1894. "Star Pointer," in harness, paced a mile against time in one minute and 59¼ seconds, at Readville, Mass., Aug. 28, 1897. "Macy" made 1 mile, 20 yards, in one minute, 40 seconds, at Washington Park, Chicago, July 2, 1898. "Firearm" made ¾ of a mile in one minute and 8¾ seconds at Morris Park, N. Y., Oct. 3, 1899. "Ethelbert" in 1900 made one record of 2¼ miles in 3 minutes, 49 seconds, and another record of 1¾ miles in 2 minutes, 58½ seconds; "Latson" made the same record as the last quoted, in 1901. "Blue Girl" made a record of 1 1-16 miles in one minute, 44¾ seconds May 23, 1901.

**Troubadour,** one of a class of poets which appeared first in Provence, in the S. of France, at the end of the 11th century. They were the inventors of a species of lyrical poetry almost entirely devoted to romantic and amatory subjects, and generally very complicated in its meter and rhymes. They flourished till the end of the 13th century. There is reason for supposing that the art of the troubadours, generally called the gay science, was derived from the East, coming into Europe through the Spaniards, and the troubadours of Provence learning from their neighbors of Spain. Troubadours frequently attached themselves to the courts of kings and nobles, whom they praised or censured in their songs; but it was a rule that some lady was selected, and to her, under some general or fancy title, love songs, complaints, and

other poems were addressed. The "love service" of the troubadours was often nothing more than mere artificial gallantry, but there are instances on record where it became something more earnest. The poems of the troubadours were not always confined to subjects of gallantry; sometimes they treated of the conditions of society, the evils of the times, the degeneracy of the clergy, and other subjects. See PROVENÇAL.

**Troubetzkoy, Amélie (Rives) (Chanler) Princess** (trö-bets'koi), an American novelist; born in Richmond, Va., Aug. 23, 1863; she lived abroad after her second marriage. She wrote: "A Brother to Dragons, and Other Tales" (1888); "The Quick or the Dead?" (1888); "Barbara Dering"; "The Witness of the Sun"; "Herod and Mariamne: Drama"; "Virginia of Virginia"; "Athelwold"; "Tanis"; etc.

**Trous-de-loup,** or **Wolf Holes,** in fortification, rows of pits in the shape of inverted cones with a pointed stake in each; intended as a defense against cavalry.

**Trousers,** or **Trowsers,** a loose garment, fastened up with braces, or suspenders, extending from the waist to the knee, or to the ankle, and covering the lower limbs; pantaloons.

**Trout,** a term applied generally to various species of fishes belonging to the salmon family (*Salmonidæ*). The best-known

COMMON RIVER TROUT.

species, and that which *par excellence* receives the name, is the *Salmo fario* or common trout, a fish which inhabits clear and running streams, and is mostly to be found tenanting some special nook from which it has to be warily drawn by the fly of the angler. The color of the trout is very characteristic. It is of a yellowish-brown color above, variegated with a dark reddish-brown hue, and marked by spots of a brilliant carmine along the lateral line. Below, a silvery white luster prevails, and the under part of the sides are a rich golden-yellow. Trout subsist largely on insects, worms, and the like fare. The bait which tempts it varies greatly from the fly to the minnow. A very peculiar and at the same time interesting fashion of capturing trout is in vogue among juvenile fishers, and is named "tickling." This process consists in feeling beneath the river banks for these fishes, in holes and like situations where they rest; when a fish is touched, the hand is outspread to prevent its escape, while, apparently, the fish, mesmerized by the action of the fingers on its sides, remains sufficiently quiet to permit of its sudden and speedy capture. The color and flesh of the trout appear to vary with the particular locality in which the fish is found. The average weight of the common trout is from three-fourths to one pound. Fishes which exceed one pound in weight may be regarded as exceptionally fine specimens. The trout is found in all the large streams and lakes of Great Britain and of Northern Europe at large.

A second species of trout is the salmon trout (*Salmo trutta*), which closely resembles the salmon in its general habits, especially in those relating to migration to the sea, and returning to the rivers to spawn. The common trout spawns about the end of October, the sexual difference between male and female then becoming markedly apparent in the elongation of the lower jaw of the former; the salmon trout spawning at about the same period. Certain species of trout are confined to certain lakes or streams, and are not found outside the bounds of these waters. In such cases special markings indicate the specific character of the fishes. Of such cases, a well-known example is the Loch Leven trout (*S. Levenensis*), which inhabits Loch Leven in Kinross-shire, a lake also tenanted by the common trout. From the latter the Loch Leven trout is distinguished by its larger size, and by the more pointed form of the pectoral fins. The tail fin is also more pointed than in the common trout, and the flesh is reddish, and wants the white or pink tint of the common trout's muscles. The pyloric cæca, or blind and pocket-like appendages attached to the hinder margin of the stomach of most fishes (and supposed to represent a pancreas or sweetbread), number from 60 to 80 in the Loch Leven trout, whereas in the common trout they are much fewer. A third species of trout is the Great Lake trout (*S. ferox*), common in some of the larger lakes of Great Britain and Ireland. It may attain a weight of 30 pounds or more, and has a prominent muzzle, and a square, truncated tail fin. The color is a dark brown, tinted with purple. This fish is a greedy feeder, devouring large numbers of smaller fishes, and is taken by night lines, or by trolling with strong tackle and a small trout for bait. The flesh is coarser than that of the preceding species. Like the Loch Leven trout the Gillaroo trout is limited in its distribution to Lough Neagh and other lakes in the N. of Ireland;

and the lake trout (*S. Lemanus*) is confined to the Lake of Geneva.

Trout are plentifully found in American waters. The common brook trout (*Salmo fontinalis*) is almost identical, if not wholly so, with the common trout of the Old World. A second well-known American species is the *Salmo confinis,* or North American lake trout, which appears to find a congenial habitat in deep lakes. Its color is dark, mottled with gray spots, and it may attain a weight of over 50 pounds. The red-bellied trout (*S. erythogaster*) occurs in fresh waters in Pennsylvania and New York, and averages from 1½ to 2 feet in length. The Oregon trout (*S. Oregonensis*) is one of the best-known and localized American species of trout, inhabiting the rivers and streams which run from the Rocky Mountains, and resembling the common trout of Europe both in size and appearance. See SALMON: SALMONIDÆ.

**Trouvère,** a name given to a member of the class of ancient poets of Northern France, corresponding to the troubadour of Provence. Their productions partake of a narrative or epic character, and thus contrast broadly with the lyrical, amatory, and more polished effusions of their southern rivals. See TROUBADOUR.

**Trover,** in law, a species of action on the case which is employed to try a disputed question of property in goods and chattels. The declaration in trover contained, previous to 1852, a formal allegation that the plaintiff lost, and the defendant found, the goods in question; but this legal fiction is now abolished, and the action is brought on a simple allegation that the defendant converted to his own use, or wrongfully deprived the plaintiff of the use and possession of the plaintiff's goods. In this action the plaintiff recovers damages equal to the value of the thing converted, but not the thing itself, which requires another form of action: detinue or replevin.

**Trowbridge,** a market town of Wiltshire, England; on a rocky hill above the small river Biss; 12½ miles S. E. of Bath. A Norman castle at Court Hill has crumbled away. The fine Perpendicular church of St. James (1475) has a spire 159 feet high; Crabbe the poet was rector from 1814 to 1832; and is buried in the chancel. There are a market house, public gardens, town hall, cottage hospital, waterworks, etc. Trowbridge has been a seat of the woolen manufacture since Henry VIII.'s reign; and superfine broadcloth and kerseymere are largely manufactured. Pop. (1901) 11,526.

**Trowbridge, John,** an American scientist; born in Boston, Mass., in 1843; was graduated at the Lawrence Scientific School, Harvard University, in 1866; served as instructor there in 1866–1869. He was assistant Professor of Physics at the Massachusetts Institute of Technology in 1869–1870. He afterward founded a laboratory course in physics at Harvard University and was Professor of Experimental Physics in 1880–1888. In the latter year he accepted the chair of applied science in the same institution. In 1878 he was elected a member of the National Academy of Sciences and in 1883 was a delegate to the International Congress of Electricians. He was the author of "The New Physics"; "What is Electricity?"; "Three Boys on an Electrical Boat"; "The Electrical Boy"; "Philip's Experiments, or Physical Science at Home"; and of many papers on physics and more especialy on electricity.

**Trowbridge, John Townsend,** an American author; born in Ogden, N. Y., Sept. 18, 1827. He began his literary career in 1846 by writing for the magazines, and in 1850 became editor of "The Yankee Nation," and co-editor with Lucy Larcom and Gail Hamilton, of "Our Young Folks." Among his most popular works are: "Neighbor Jackwood" (1857); "Cudjo's Cave" (1863); "Coupon Bonds, etc." (1872); "His Own Master" (1877); "The Tinkham Brothers' Tide-Mill" (1882); the "Jack Hazard Stories, etc."; "The Kelp Gatherers" (1890); "The Scarlet Tanager" (1891); "Woodie Thorpe's Pilgrimage" (1893); "The Lottery Ticket" (1895); "The Prize Cup" (1896); "Two Biddicut Boys, etc." (1898); also several volumes of poems, among them "The Vagabonds and Other Poems" (1869); "The Book of Gold" (1877); "The Lost Earl" (1888).

**Trowbridge, William Petit,** an American engineer; born near Birmingham, Mich., May 25, 1828; was graduated at the United States Military Academy in 1848; served on the United States Coast Survey in 1851–1853; conducted tidal and magnetic observations on the Pacific coast in 1853–1856; taught in the University of Michigan in 1856; superintended the erection of a self-registering magnetic observatory in Key West in 1860; and was employed in the preparation of minute descriptions of the harbors, inlets, and rivers of the S. coast and in the supervision of the distribution of supplies to the Union army in 1861–1865. He was chief engineer in the construction of the fortifications at Willett's Point, on Governor's Island, and at other points, and was also for several years Professor of Engineering at Yale and Columbia Universities. He was an expert on bridge construction. Special recognition is due him for his design of the first cantilever bridge and for his invention of a high class coil boiler. He died in New Haven, Conn., Aug. 12, 1892.

**Trowel,** a flat metal tool used by masons, plasterers, and bricklayers, for lifting, spreading, and dressing mortar and plaster, and for cutting bricks so as to reduce them to the required shape and dimensions. Also a gardener's implement, having somewhat the shape of a masons' trowel, used in taking up plants, and for other purposes.

**Trowlesworthite** (named from Trowlesworthy Tor, in Devonshire, at the S. W. angle of Dartmoor, on which, as a loose bowlder, it was found by Mr. Worth), a rock consisting chiefly of reddish orthoclase, purple flour, and black schorl, in intimate connection with quartz. It appears to have been formed by a peculiar alteration of granite, in which black mica has been changed into tourmaline, some of the felspar has been replaced by schorl and quartz, and the original quartz constituents by fluor spar.

**Troy,** a city and county-seat of Rensselaer co., N. Y.; at the confluence of the Hudson and Mohawk rivers; at the head of tide water and steamboat navigation, and on the Fitchburg, the Delaware and Hudson, the New York Central and Hudson River, and other railroads; 6 miles N. of Albany. The city has a water frontage of about 3 miles. It is built partly on a plain and partly on a range of hills. There are several bridges across the Hudson at this point.

*Business Interests.*—Troy is the principal outlet for the canal systems connecting the Hudson river with Lakes Champlain, Erie and Ontario. The commodities transported by these canals annually amount in value to about $20,000,000. There is a daily line of steamers to New York, and considerable commerce by water with various Atlantic coast points. Troy is one of the most important of Eastern manufacturing centers. In the business of making linen shirts, collars, and cuffs, and in the laundry industry, it surpasses every other city in the United States. More than 6,000 persons are employed in the former business. The iron furnaces and manufactories of iron and steel are the largest E. of the Alleghenies. Other industries include the manufacture of stoves, car wheels, cotton goods, knit goods, flour, railroad cars, coaches, boots and shoes, etc. There are also large breweries, brickyards, and lumber mills. There are 6 National banks in operation with a combined capital of $1,690,000, and many daily, weekly, and monthly periodicals. The assessed property valuations exceed $49,000,000, and the total debt is about $1,290,000.

*Public Interests.*—The city has an area of 5 square miles; 90 miles of streets, of which 37¾ miles are paved; a system of waterworks which cost $1,311.000, with 62 miles of mains, and a sewer system covering 49 miles. The streets are lighted by gas and electricity at an annual cost of about $81,000. The police department costs about $105,000 per annum, and the fire department nearly $52,000. There is a public school enrollment of 7,000 pupils, and expenditures for public education of about $150,000 per annum. The annual cost of maintaining the city government is about $750,000. Troy is the seat of Rensselaer Polytechnic Institute, Willard Female Academy, La Salle Institute, and St. Peter's Academy. There are about 70 churches, two orphan asylums, an Asylum for the Insane, and other private and public benevolent institutions.

*History.*—The site of the city was a part of the Van Rensselaer grant of 1629. Van der Heyden was one of the first settlers. He purchased a farm of 65 acres which in 1787 was laid out as a village. The name, Troy, was adopted in 1789, and the place was chartered as a city in 1816. It has been three times nearly destroyed by fire. In 1892 there were election riots there during which Robert Ross was murdered. One of his slayers, "Bat" Shea, was executed in 1896. Pop. (1890) 60,956; (1900) 60,651, excluding the sections annexed in 1901; (1910) 76,813.

**Troy,** or **Troja,** in classical legend and geography, the name of a district in the N. W. part of Mysia, in Asia Minor, and of a city situated in it. The latter was also called Ilium, and the former Troas, now the Troad. According to the account of Homer, the city was situated on ground rising above the plain formed by the rivers Scamander and Simoïs. On the S. E. was a hill, which was a spur of Mount Ida, and on which were the acropolis of the Trojans called Pergamum, the palaces of the king, and the temples of the gods. No such city as Troy, and no such people as the Trojans, were known in historic times. There have been various opinions respecting the site of the ancient city, and many efforts made to reconcile the present topography with the geographical statements made in the Homeric poems, the most important work in this line being the excavations of Schliemann in the Troad, at the mound of Hissarlik, long the traditional site of Troy.

Schliemann excavated Hissarlik, and came first on the remains of the Græco-Roman town, Novum Ilion, or New Troy; below it he dug out the ruins of four (or three) village settlements, one below another; below them he came on "the burnt city," and finally on the lowest, the oldest, the first city. This yielded in the way of relics principally pottery and stone implements. Metals were practically unknown to its inhabitants, who were plainly a settled pastoral and agricultural people. The interval that elapsed between the desertion and decay of this first city and the founda-

tion of the next must have been long, for a layer of earth 1 foot 9 inches deep intervenes between the debris of the first and the second or "burnt city." The inhabitants of this city were, however, still in the stone age; but the number of gold and silver relics, and the presence of some copper implements, point to the approach of the bronze age, and seem to indcate a transition from the age of stone to that of metals. The two most important facts in connection with this city are the discovery of what Schliemann believed at first to be "Priam's Treasure" and the evidence that the city was destroyed in a conflagration. The treasure consists of big diadems of gold, chains and pendants of gold, golden earrings, all packed in a silver jar, bars of silver, 8,700 small gold rings, disks, buttons, and small bars of gold, silver vases, gold cups, electrum cups, silver daggers, etc. The whole of this treasure had been packed together and stowed away probably in a secret chamber constructed in the acropolis wall. Scholars are not agreed as to the accuracy of Schliemann's discoveries. Some place the site of ancient Troy in the neighborhood of modern Bunaibashi.

**Troyes** (trwä), the Augustobona, later Civitas Tricassium of the Romans, a town in France; capital of the department of Aube; on the Seine, 100 miles E. S. E. of Paris. The principal edifices are the cathedral, a fine Gothic building; the churches of St. Urbain and St. Madeleine; the town house; the prefecture, a public library, museum, etc. Being at the center of an important agricultural region, it has a large transit trade. The manufactures chiefly consist of cottons, woolens, hosiery, soap, artificial flowers, paper, gloves, etc. Pop. (1906) 53,447.

**Troy Weight,** a system of weights used for gold, silver, platinum, and precious stones. The Troy pound contains 12 ounces, 240 pennyweights, and 5,760 grains, being thus less than the avoirdupois pound, which contains 7,000 grains. The old apothecary's weight, which had the same value of pound as the Troy, but subdivided into 12 ounces, 96 drachms, and 288 scruples, was abolished in Great Britain and the new apothecary's weight made the same as the avoirdupois. The name Troy was given to the standard pound in 1495. The origin of the name is doubtful, some deriving it from "Troy Novant," the monkish name of London, others from Troyes in France.

**Truant School,** a school for truant or vagabond children. In the United States, the establishment of schools purely of such a nature is quite recent. In 1850, Massachusetts passed a law permitting the punishment of truancy by confinement. New Hampshire, New York, Rhode Island and Connecticut made similar legislation before 1865; and New York and other cities made like provisions; but where the law was not a dead letter, habitual truants were classed as "juvenile disorderly persons" and were sent to almshouses or reformatories. In 1880, Massachusetts began to establish county schools for truants. In 1900 there were in the United States six county schools and seven city schools of this nature, five in New York city, one in Boston and one in Chicago. Many States and cities provide for the arrest of truants and their being replaced in the public schools, a method followed in Continental Europe, where there are no institutions exactly parallel to the American truant school. In Great Britain there are two provisions for school offenders, the day industrial and the truant schools, based on the Industrial Schools Act of 1866, for "any child found habitually wandering, or not under proper control, or in the company of rogues, vagabonds, disorderly persons, or reputed criminals"; or any child whose parents neglect to provide for its instruction. There were 23 schools of the first kind in England and Scotland in 1896, and 15 truant schools (for boys only). The period of detention is brief, but the discipline punitive.

**Truce,** a suspension of arms by agreement of the commanders of opposing armies; a temporary cessation of hostilities, either for negotiation or other purpose. The truce of God was a suspension or arms which occasionally took place in the Middle Ages, and was introduced by the Church in order to mitigate the evils of private war. This truce provided that private feuds should cease at least on the holidays from Thursday evening to Sunday evening each week, during the season of Advent and Lent, and on the octaves of the great festivals.

**Truckee River,** a river in California, forming the outlet of Lake Tahoe. It runs nearly N. and enters the State of Nevada, intersecting Washoe county and emptying into Pyramid Lake in Roop county. It is nearly 125 miles long and abounds in trout.

**Truck System,** the practice of paying workmen in goods instead of money. Where large undertakings are carried on at a distance from towns, it is almost necessary that employers should take steps to provide for a regular supply of provisions and other necessaries, to be sold to their men. This form of trading is open to objections on many grounds. The profit to the employer is very doubtful, for the capital which he devotes to his shop might probably be used to greater advantage in his proper business; the men are liable to be defrauded in various ways, because they cannot bargain on equal terms with their employer. A colliery owner, for example, may set up a shop, and may refuse to employ any man who does not deal at the

shop. He may supply goods of inferior quality, and dismiss any man who is bold enough to complain. He may make the advances frequently required by the improvident wage earner, intimating at the same time that he expects the money to be spent at his shop and no other; the account may be further complicated by vexatious deductions of pay for sharpening tools, etc.; and the workman may submit to all these exactions, because there is the threat of dismissal in the background. The evils of the system are known in many countries. In England the Truck Act of 1831 (extended by the amending act of 1887 to all persons engaged in manual labor, except domestic servants) was intended to provide a remedy. Wages are directed to be paid in current coin; the employer cannot plead payment in goods as an answer to an action for wages, nor can he maintain an action for the price of the goods supplied. He may supply medicine, medical attendance, fuel and tools for mining, provender for beasts, house accommodation, and victuals prepared under his own roof. Deductions of pay are strictly regulated by the Act of 1887. These statutory rules are sometimes evaded; men who require advances of pay are too much at the mercy of employers to take advantage of the acts. The evils of the system are graphically described in Disraeli's "Sybil." In 1853 J. H. Burton was employed by the government to investigate the working of the system in Scotland. His report seems to indicate that legislation fails to reach the abuses complained of; attempts to suppress a long-standing practice may even strengthen its hold. Combination and improved habits of thrift among workmen put an end to the system by making them less dependent on their employers. Employers who evade the law usually allege that they cannot help themselves. The rate of wages, they say, is fixed on the assumption that part will come back in the shape of profit on goods; if they give up the shop, they must pay lower wages, and this the men will not stand. For the English law relating to this subject, see Macdonell, "Law of Master and Servant."

**True, Alfred Charles,** an American statistician; born in Middletown, Conn., June 5, 1853; was graduated at Wesleyan University, Conn., and studied at Harvard University in 1882–1884; was an instructor at Wesleyan University in 1884–1888. He then entered the United States Department of Agriculture; was editor in the office of the experiment station in 1889–1890, was vice-director of the same in 1891–1892 and became director in 1893. He was also made editor-in-chief of the "Experiment Station Record" and the "Experiment Station Work" and was given supervision of expenditures for agricultural experiment stations in all the States and Territories. He also took charge of investigations in irrigation, and in agriculture in Alaska, Porto Rico, and Hawaii. His publications include monographs on agricultural experiment stations in the United States, and agricultural education.

**True, Charles Kittridge,** an American educator; born in Portland, Me., Aug. 14, 1809. He was pastor of various Methodist churches, and subsequently Professor of Intellectual Philosophy at Wesleyan University (1849–1860). He was the author of "Elements of Logic" (1840); "Shawmut; or, The Settlement of Boston" (1845); "John Winthrop" (1875); "Sir Walter Raleigh" (1878); "Life and Times of John Knox" (1878); "Memoirs of John Howard" (1878); "The Thirty Years' War" (1879); "Heroes of Holland" (1882). He died in Brooklyn, N. Y., Jan. 20, 1878.

**True, Frederick William,** an American biologist; born in Middletown, Conn., July 8, 1858; was graduated at the University of the City of New York in 1878; became connected with the government service in 1878; and was appointed expert special agent on fisheries for the 10th census, 1879. He next served as custodian of the collections of the United States Fish Commission at the Berlin Fisheries Exhibition in 1880. He was curator of the department of mammalia at the United States Museum in 1881–1892, and was executive curator in 1892–1897. In the latter year he was made head curator of the Department of Biology at the United States National Museum. During the exposition in Nashville in 1897, Omaha in 1898, and Buffalo in 1901, he was the representative of Smithsonian Institution. He was the author of "Review of the Family of Dephinidæ"; etc.

**Trueba y Cosio, Telesforo de** (trwā'-bä ē kōs'yō), a Spanish poet; born in Santander, Spain, in 1798. He wrote several comedies, as "The Fickle One" and "Marrying on 60,000 Duros." He wrote in English several historical novels, among them "Gomez Arias" (1828), and "The Castilian" (1829); and also in English, "Lives of Cortés and Pizarro" (1830), and the historical drama "The Royal Delinquent." The most successful of his works was "Paris and London" (1833), a portraiture of manners and morals. He died in Paris, Oct. 4, 1835.

**Truffle,** a genus of fungi of the order *Tuberacei,* division *Ascomycetes;* globose, or nearly so; of a fleshy substance, with a distinct skin, the whole substance pervaded by a network of serpentine veins, which are the hymenium, and bear the spore-cases in minute cavities. The species are not nu-

merous; they are very generally diffused in temperate parts of the world; they are subterranean, often found at the depth of a foot or more in the soil, usually near the roots of trees, or rarely living on the surface. Some of them are among the most highly valued or esculent fungi. They are said to have a stimulating aphrodisiacal quality. The common truffle (*T. æstivum*) is of a black color, and has a warty surface. It is the principal species sold in the English markets. It varies in size from that of a large plum to that of a large potato. On account of its agreeable flavor, it is used in the preparation of many dishes. It is common in Central and Southern Europe, chiefly in loose soils, in woods and pastures, as in the chestnut woods of France and Italy. In England it occurs pretty abundantly in the downs of Wiltshire, Hampshire, and Kent. Truffles probably occur in many districts, but owing to their subterranean growth are unsuspected. In England, and also on the Continent in localities in which they are known to grow, trained dogs are employed to discover their whereabouts, and in France and Italy pigs are employed for the same purpose. The best French truffle, which is considered superior to the English, is *T. melanosporum*. The white truffle of Germany, which also is found in England, is *Choiromyces albus*, a genus closely allied to tuber, but less esteemed in cookery than the common truffle. The red truffle of the Bath market is *Melanogaster*, a genus of the allied order *Hypogœi*, and is not therefore a true truffle. The African truffles, species of *Terfezia* and *Tirmannia*, somewhat inferior to it in quality, are in some parts of Algeria and Tunis an important food-supply for the people. All attempts at cultivating the truffle in England have hitherto failed. In the S. of France they have, it is said, been produced in woods which have been watered with water in which the parings of the truffle had been steeped. As yet, however, the manufacture of spawn, as in the case of the mushroom, has been attempted in vain. In Poitou the practice prevails of enclosing a space on the downs and sowing it with acorns. When the oaks are large enough to shade the ground, it is said there is sure to be a crop of truffles. Light chalk soil appears to be preferred by truffles, and they are found most usually in beech, oak, birch, chestnut, hazel, and hornbeam woods.

**Trujillo** (trö-hēl'yo), (1) a town of Spain, the birthplace and burial place of Pizarro, in Cáceres province, 60 miles N. E. of Badajoz. It is built partly on a granite crag, and manufactures linen, leather, and pottery. Pop. (1900) 12,512. (2) An episcopal city of Peru, capital of the department of Libertad, on a fertile plain near the seacoast. It was founded by Pizarro in 1535, has walls that were raised in 1686 to keep out the filibusters, and contains a college, a theological seminary, and high school. Its ports are Huanchaco and Salaverry. (3) A port of Honduras, on the N. coast (bananas, hides, mahogany, rubber, and cattle). The town dates from 1524.

**Truman, Benjamin Cummings,** an American author; born in Providence, R. I., Oct. 25, 1835; received a public school education; served on the staff of Andrew Johnson, military governor of Tennessee, in 1862. After the assassination of President Lincoln he was on the staff of President Johnson for 18 months; and served afterward as a special agent of the United States government to China, Japan, Europe, Hawaii, and Alaska. His publications include "The South During the War"; "Occidental Sketches"; "Winter Resorts of California"; "From the Crescent City to the Golden Gate"; "The Field of Honor"; "History of the World's Fair in Chicago"; etc.

**Trumbull, Gurdon,** an American ornithologist; born in Stonington, Conn., May 5, 1841; brother of Henry Clay and James Hammond. He published "American Game Birds; or, Names and Portraits of Birds, with Descriptions" (1888), and a notable paper on the "American Woodcock" (1890). He died Dec. 28, 1903.

**Trumbull, Henry Clay,** an American editor; born in Stonington, Conn., June 8, 1831. He was army chaplain, 1862–1865; afterward secretary of the American Sunday-School Union, 1865–1872; and after 1875 editor of the "Sunday-School Times." He published many books, including "Army Sermons" (1864); "The Knightly Soldier" (1865); A Useful Life," etc. (1866); "The Captured Scout" (1869); "Children in the Temple" (1869); "A Model Superintendent" (1880); "Kadesh-Barnea" (1884); "Teaching and Teachers" (1884); "The Blood Covenant" (1885); "Yale Lectures on the Sunday-School" (1888); "Hints on Child Training" (1890); "Friendship the Master Passion" (1891); "Studies in Oriental Social Life" (1894); "Prayer" (1896); "War Memories" (1898); "The Covenant of Salt" (1899); etc. He died Dec. 8, 1903.

**Trumbull, James Hammond,** an American philologist; born in Stonington, Conn., Dec. 20, 1821; brother of Henry Clay. He was secretary of state of Connecticut during the Civil War, 1861–1864, and held many honorable posts connected with historical and educational associations. He was president of the American Philological Association in 1874–1875. He made the Indian languages of North America a special study; became an acknowledged authority

on the Algonquin tongues; and published many essays on Indian philology. He was a frequent contributor to proceedings of historical societies. Among his works are: "The Colonial Records of Connecticut" (1850–1859); "Historical Notes on Some Provisions of the Connecticut Statutes" (1860–1861); "The Composition of Indian Geographical Names" (1870); "Historical Notes on the Constitution of Connecticut" (1872); "The True Blue Laws of Connecticut," etc. (1876). He edited "The Memorial History of Hartford County" (1886). His knowledge of books was vast; as a collector and book-buyer he had few superiors; and his name is associated with the sale of the "Brinley Library," and with the Watkinson Library at Hartford. He died in Hartford, Conn., in 1897.

**Trumbull, John,** an American poet and lawyer; born in Westbury, Conn., April 24, 1750. He wrote, with Timothy Dwight, a series of essays in the "Spectator" style, which first drew attention to his ability. In "The Progress of Dullness" (1772–1773) he satirized contemporary methods of education; but he won his greatest fame with "McFingal" (1775–1782), a satire on the loyalists of the Revolution time, written in Hudibrastic verse. Thirty pirated editions are said to have been sold; and some of its lines are still "familiar quotations" popularly credited to "Hudibras." Later he was associated with Joel Barlow and others in the production of "The Anarchiad" (1786–1787). His "Poetical Works" were published at Hartford, Conn., in 1820. He died in Detroit, Mich., May 10, 1831.

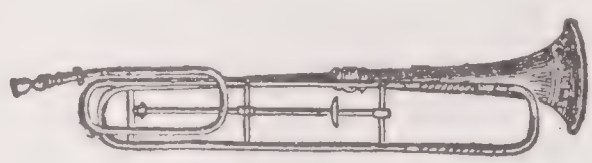
**Trumbull, John,** an American artist; born in Lebanon, Conn., June 6, 1756; grandson of the first Jonathan Trumbull; was graduated at Harvard College in 1773; studied painting in Boston; served in the Revolutionary War on the staffs of Generals Washington and Gates; and in 1780 went to England to become a pupil of Benjamin West, but was arrested on a charge of treason and forced to leave the country. On the conclusion of peace he returned to England and resumed his studies under West. In 1786 he produced his first historical picture, the "Battle of Bunker Hill"; which was soon followed by the "Death of Montgomery Before Quebec" and the well known "Sortie of the Garrison from Gibraltar." After serving for several years as a secretary to John Jay, the American minister to England, and as a commissioner to execute the seventh article of Jay's treaty, he returned to his profession. In 1817 he was employed by Congress to paint four pictures for the rotunda of the Capitol at Washington. For these works, which represented "The Declaration of Independence," the "Surrender of Burgoyne," the "Surrender of Cornwallis," and the "Resignation of Washington at Annapolis," he received $32,000. Subsequently he was for many years engaged in finishing former sketches and painting copies of the National pictures, many of which, together with portraits and several copies of old masters, 54 pictures in all, he gave to Yale College in consideration of an annuity of $1,000. He died in New York city, Nov. 10, 1843.

**Trumbull, Jonathan,** an American patriot; born in Lebanon, Conn., Oct. 12, 1710; was graduated at Harvard in 1727; was successively judge, deputy-governor, and governor (1769–1783) of Connecticut; and took a very prominent part in forwarding the Revolutionary War. Washington placed great reliance on him, and frequently consulted him; to this habit, and his phrase, often repeated when in doubt, "Let us hear what Brother Jonathan says," has been traced the name which stands (though not so generally now as "Uncle Sam") for a personification of the United States as "John Bull" does for England. Trumbull died Aug. 17, 1785.

**Trumbull, Lyman,** an American statesman; born in Colchester, Conn., Oct. 12, 1813; removed to Belleville, Ill., in 1837; became secretary of state of Illinois in 1841; and justice of the Supreme Court of the State in 1848. In 1854 he was elected to Congress as a Democrat, and in 1855 was chosen United States senator. He joined the Republican party on the anti-slavery principle, in 1860, and supported Abraham Lincoln; was reëlected to the Senate; secured the passage of the Fourteenth Amendment; and was one of the Republicans who voted against the impeachment of Andrew Johnson. Later, he became a Democrat. He died in Chicago, Ill., June 25, 1896.

**Trumbull, Fort,** a Revolutionary fort on the W. side of the Thames river, below New London, Conn., and opposite Fort Griswold. It is still garrisoned.

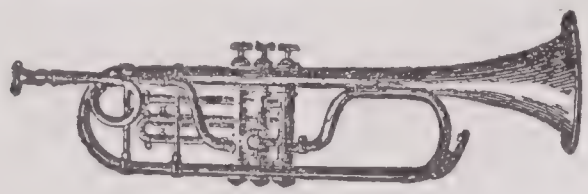
**Trumpet,** in music, a metal wind instrument of bright and penetrating tone, formed of a single tube of brass or silver,



ORCHESTRAL TRUMPET.

curved into a convenient shape, with a mouthpiece at one end, the other having a bell. Its part is usually written in the key of C with the treble clef, though by means of crooks or lengthening pieces the sounds produced may be in various keys. The trumpet required for a piece is indicated at the commencement, as trumpet in B, C, D flat, E, F, or G. The modern orches-

tral or slide trumpet consists of a tube 66¾ inches in length and three-eighths of an inch in diameter. It is twice turned or curved, thus forming three lengths; the first and third lying close together, and the second about two inches apart. The slide is connected with the second curve. It is a double



VALVE TRUMPET.

tube, five inches in length on each side, by which the length of the whole instrument can be extended. Trumpets with pistons or valves capable of producing every chromatic sound within their compass are sometimes used, but the tone is by no means to be compared with the true trumpet tone. Also, a stop of an organ having reed pipes tuned in unison with the open diapason. The octave trumpet or clarion stop is an octave higher.

In spinning, the funnel which leads a sliver to the cylinders of a drawing machine, or which collects a number of combined rovings, and leads them to condensing cylinders. Also, a funnel-shaped conductor used in many forms of thread machines and stop motions in knitting, spinning, and doubling machines.

**Trumpeter,** in ichthyology, the *Latris hecateia,* one of the most important food fishes of the Southern Hemisphere. It ranges from 30 to 60 pounds in weight, and is considered by the colonists the best flavored of any of the fishes of New Zealand, Tasmania, and South Australia. Large numbers are smoked and sent into the interior. In ornithology, any species of the genus *Psophia.* They are South American birds, allied to the crane, inhabiting the forests, frequenting the ground in search of grain for food, and often betraying their presence by their loud call, whence both their popular and scientific names are derived. The best known species, *P. crepitans,* is very beautiful. The breast is adorned with brilliant changing blue and purple feathers, with metallic luster; head and neck like velvet; wings and back gray, and belly black. They run with great swiftness, and are capable of domestication, attending their master in his walks with as much apparent affection as his dog. They have no spurs, but such is their high spirit and activity, that they browbeat every other fowl in the yard, as well as Guinea birds, dogs, and turkeys.

**Trumpet Flower,** a name applied to various large tubular flowers, as those of the *Bignonia.*

**Trumpets, Feast of,** in Jewish antiquity, a feast on the first day of the seventh month (Tisri), which was to be kept as "a sabbath, a memorial of blowing of trumpets, an holy convocation." No servile work was to be done in it; but an offering of fire was to be presented to Jehovah (Lev. xxiii: 23–25). It preceded by 10 days the Great Day of Atonement (27). In Numbers (xxix: 1–6), details are added as to the "offering of fire," which was to include a burnt offering, a meat offering, and a sin offering. The first of Tisri was New Year's Day of the civil year. It is still observed as a Jewish festival.

**Trumpet Shell,** in zoölogy, the *Triton variegatus,* from the West Indies, Asia, and the South Seas. The shell, which is a foot or more in length, is white mottled in irregular spiral rows with ruddy brown and yellow, deepening into chestnut at the point; interior white; lip with smooth white ridge on a black ground. It is employed by the Australian natives and the South Sea Islanders as a trumpet. To fit the shell for this purpose a round hole is bored at the side, about one-fourth the length from the tip, and a loud hoarse sound is produced by blowing across the hole, as a performer plays a flute. While blowing, the right hand is placed in the cavity of the shell.

**Trumpet Weed,** in botany: (1) The popular name for *Eupatorium purpureum.* It has a purple stem five or six feet high, leaves petiolate by fours or fives, and purple flowers; found on low grounds in the United States, flowering in August and September. (2) The name given at the Cape of Good Hope to a large seaweed, *Ecklonia buccinalis,* the stems of which, often 20 feet long and hollow above, are used by native herdsmen as trumpets to collect the cattle together. They are also employed as siphons.

**Trumpp, Ernst** (trömp), a German Orientalist; born in Ilsfeld, Würtemberg, March 13, 1828. His principal work is "The Adi Granth; or, The Holy Scriptures of the Sikhs, Translated from the Original Gurmukhi" (1877). He wrote also: "The Language of the So-called Caffres in the Hindu Caucasus"; "Sindi Literature: The Divan of Abd-ul-Latif" (1866); "The Baptism Book of the Ethiopian Church" (1876). He died in Munich, Bavaria, April 5, 1885.

**Truncatella,** in zoölogy, looping snail; a genus of *Littorinidæ* (Woodward), of *Acicularidæ* (Tate), with 15 species widely distributed. Operculum shelly, with erect radiating lamellæ; aperture of shell ovate; last whorl separate, peristome continuous, expanded. Widely distributed on shores and seaweed between tide marks, and can

survive many weeks out of water. They walk like the geometric caterpillars, by contracting the space between their lip and foot. They are found semi-fossil, along with human skeletons, in the modern limestone of Guadaloupe.

**Trunk Engine.** See STEAM ENGINE.

**Trunk Fish.** See COFFER FISH.

**Trunk Hose,** a kind of short, wide breeches, gathered in above the knees, or immediately under them, and distinguished according to their peculiar cut as French (of which there were two kinds, one wide, the other closely fitting), Gallic (reaching to the knee) and Venetian (coming below the knee). They were worn in England during the reigns of Henry VIII., Elizabeth, and James I.

**Trusdell, Charles Gregory,** an American philanthropist; born in Montgomery, N. Y., May 1, 1826; received an academic education; studied theology and was ordained in the Methodist Episcopal Church in 1857; was presiding elder of the Iowa City district in 1865; pastor in Chicago till the fire of 1871. He was then made general superintendent of the Chicago Relief and Aid Society, and in this position nearly $5,000,000 from all over the world passed through his hands to the sufferers. After the relief of the fire sufferers, the society was continued for the benefit of the poor in Chicago, and Mr. Trusdell was made its permanent superintendent. Died in 1903.

**Truss,** in architecture, an ornamented corbel, serving to support an entablature or balcony, or to conceal the ends of the beams which really support the structure; in the latter case it is frequently made of galvanized sheet iron. In carpentry, a frame to which rigidity is given by staying and bracing, so that its figure shall be incapable of alteration by the turning of the bars about their joints. The simplest frames are of wood, and of few parts. More imposing structures are more complicated, the parts being employed in resisting extension or compression. Composite trusses employ both wood and iron; in fact, few of any importance are destitute of bolts and tie rods. In the simplest form of a truss the tie beam is suspended by the king post from the apex of the angle formed by the meeting of the rafters. In the more complex form the tie beam is suspended by the queen posts from two points. In shipbuilding, a short piece of carved work fitted under the taffrail; chiefly used in small ships. Also, the iron hoop, stirrup, and clasp by which the middle of a lower yard is secured to the mast. It consists of a hoop on the mast, tightened by means of screws, whose open heads engage the eyes of a stirrup, which is swiveled to the hoop on the yard. In surgery an instrument to keep hernia reduced, that is, to retain the intestines within the abdominal cavity. The essential feature is a spring or bandage resting on a pad, which is kept above the orifice of protrusion, the pad being kept to its place by the spring.

**Truss Bridge.** See BRIDGE.

**Trust.** A trust, in the legal sense of the word, is an arrangement whereby property is held by one person for the benefit of another. The person who holds the property is called a trustee; the beneficiary of the trust is known as *cestui que trust* (Old French for *celui qui confie*, he who entrusts or confides). Trusts are generally created by wills, for the benefit of widows, minor children and other heirs, but also by marriage settlements and other grants *inter vivos*. Bequests and gifts to churches, colleges, charitable institutions and the like, are generally administered by trustees. Trusts of real estate must be declared in writing. A trustee is not compelled to accept a trust, but if he does he must discharge the obligations connected with it according to law, and without compensation except such as may be allowed by the terms of the trust or awarded by the court. Any legal person may be a trustee or a *cestui que trust*. A trustee may be held accountable for failure to invest the funds of the trust in the manner prescribed by law. Breach of trust was not a crime at common law, but is now generally punishable under statutes as a form of embezzlement. Where there are several trustees the office is considered joint, so that if one dies the survivors continue to exercise the office. Many trusts are now administered by corporations known as trust companies, which have had a remarkable growth in recent years. The Comptroller of the Currency reports 585 loan and trust companies existing in the United States at the beginning of the year 1904, with assets aggregating $2,380,287,747. The trust company must not be confounded with the industrial "trust," an organization of totally different character and aims. See TRUSTS.

JAMES EDWARD LE ROSSIGNOL.

**Trust, Charitable,** real or personal property vested in trustees to be applied to objects of public benevolence. It is differentiated from all others (private trusts) by (*a*) its administration for strictly public uses; (*b*)—most distinctive—the indeterminate character of the beneficiaries; and (*c*) the fact that it is not subject to statutory provisions limiting the period during which full power of alienation may be suspended. In the United States, although some States fail to distinguish between charitable and other trusts, these principles are generally recognized in the decisions of the courts.

**Trust Companies.** A trust company is a form of fiduciary corporation whose primary function is to execute trusts for individuals, living and dead, and for estates and corporations. Trust companies in the United States have added to these functions many of the features of banks of deposit, and in some cases of commercial banks. As a rule, however, even the banking functions of the principal trust companies of large cities differ somewhat from those of commercial banks. Trust companies lend money upon stock exchange securities in larger proportion than on commercial paper of merchants, and some do not lend at all upon such paper. Their deposit accounts also are usually less active than those of commercial banks, and as interest is paid upon them, the companies are not under reciprocal obligation to extend accommodation to depositors in the way of loans, which is a part of the policy of commercial banks. The big industrial combinations which have been the product of the last few years have contributed to the creation of large reserve deposits and inactive accounts, and do not expect accommodation in the way of loans on their paper to the same extent as the smaller industrial corporations and private partnerships from which they were formed.

In its function as trustee for private individuals, the trust company has superseded to a large extent private trustees and individual attorneys in the custody and administration of wills. The trust company has the advantages of a fixed and permanent office, continuous life, absolute corporate responsibility, and expert employees devoting their time and attention exclusively to the trusts confided to its care. Investments for estates under trust company management are systematized, and are restricted by law. One of the most important functions of the modern trust company is the execution of trusts for corporations. It is a trust company which usually acts as trustee for the bondholders of a railway and as custodian of the mortgage. It may also act as transfer agent and registrar, in these capacities employing expert employees who can render the services at less cost than they could be rendered by each corporation separately, and yet with a profit to the trust company.

The growth of trust companies as competitors of national banks in receiving deposits and making loans has led to a strong effort in some States to enforce upon them the maintenance of cash reserves against their deposits, similar to those required by law from national banks and some State banks. The trust companies in New York objected that they should not be subject to the same requirements as the national banks, because they were not the centers of the banking system of the country and legal custodians of the reserves of country banks, as were the national banks. It has been generally admitted, however, that some regulation of reserves was desirable. In the spring of 1903, the New York Clearing House established a rule under which trust companies must keep certain reserves or withdraw from the Clearing House. All but a few withdrew, and thereafter kept such reserves as they thought proper. The point of difference of opinion was less the necessity of having some reserve than the character and location of the reserve. The Clearing House sought to enforce the keeping of actual currency in the vaults of the trust companies, while the larger trust companies preferred to keep reserves on deposit in national banks. At the session of 1906, the New York Legislature passed an act, representing a compromise between conflicting views, requiring trust companies in New York City to establish within a reasonable interval reserves of 15 per cent. of their deposits, of which only 5 per cent. was required to be in currency, 5 per cent. might be on deposit in another banking institution, and 5 per cent. might be kept in first-class bonds.

The number and resources of the trust companies of the United States have grown rapidly within fifteen years. Reports made to the Comptroller of the Currency show the following figures for representative years:

| *Year.* | *Number.* | *Capital.* | *Individual deposits.* |
|---|---|---|---|
| 1891 | ....171 | $ 79,292,889 | $ 355,330,080 |
| 1897 | ....251 | 106,968,253 | 566,922,205 |
| 1901 | ....334 | 137,361,704 | 1,271,081,174 |
| 1902 | ....417 | 179,732,581 | 1,525,887,493 |
| 1903 | ....531 | 232,807,735 | 1,589,398,796 |
| 1904 | ....585 | 237,745,488 | 1,600,322,325 |
| 1905 | ....683 | 243,133,622 | 1,980,856,737 |

See also Banks and Banking in the United States.

Charles A. Conant.

**Trustee,** one who holds lands, tenements, or other property, on the trust and confidence that he will apply the same for the benefit of those who are entitled, according to an expressed intention, either by the parties themselves, or by the deed, will, settlement, or arrangement of another. In law, a person in whose hands the effects of another are attached in a trustee process—that is, a process by which a creditor may attach goods, effects, and credits belonging to or due to his debtor, when in the hands of a third person. See Trust.

**Trust Fund.** It has been held in the courts of the United States that the capital stock of any corporation is a so-called "trust fund" for the settlement of the indebtedness of such corporation. The term is an inaccurate one, inasmuch as, were the stock a genuine trust fund, equal distribution to all creditors might be enforced, whereas at present the one first levying

execution may satisfy his entire claim.

**Trusts.** The industrial "trust," a device for securing the combination of rival manufacturing companies, had its origin on January 2, 1882, when an agreement was signed by stockholders and officers of the Standard Oil Company of Ohio and 39 other companies engaged in the manufacture and transportation of petroleum, by which the entire stock of most of the companies, and a controlling interest in the others, was placed in the hands of a board of nine trustees, who thereupon assumed control of the business of the various companies. In return for their stock the former owners received trust certificates, entitling them to shares in the consolidation proportional to the estimated value of the stock surrendered. Certificates were issued amounting to $70,000,000, which, according to von Halle, "exceeded the actual value by at least 100%." Thus was formed the Standard Oil Trust, and thus the name "trust" came to be applied to any large combination of manufacturing interests, whether organized on the model of the trust or in some other way. Presently other great manufacturing companies, dissatisfied with pools and similar loose agreements, began to establish trusts in their respective fields. Among them may be mentioned the American Cotton Oil Trust, formed in 1883, the Sugar Refineries Company, in 1887, and the Distillers' and Cattle Feeders' Trust, in 1887. About the same time there arose a popular agitation against the trusts, in consequence of which various laws were passed to check or regulate their monopolistic tendencies. The Interstate Commerce Act of 1887 was such a law, as was also the "Act to Protect Trade and Commerce Against Unlawful Restraints and Monopolies," passed in the year 1890 and commonly known as the Sherman Anti-Trust Act. Anti-trust acts were also passed in many of the States, notably in Texas in 1889 and in Illinois in 1891. In several States suits were brought against the trusts and in two important cases decisions were obtained against them. In the case of People *v.* The North River Sugar Refining Company (121 N. Y. 582), decided in 1890, the court held that the sugar company had no right under its charter to place the stock in the hands of trustees. The court also held that there was danger of monopoly and that the corporation laws of the State were not designed to facilitate the formation of enormous combinations or partnerships of independent corporations. A similar decision was rendered in 1892 by the Supreme Court of Ohio in the case of State *v.* Standard Oil Company (49 Ohio St. 137). In the words of the court: "The trust agreements in question are acts which must be regarded as acts of the corporations, and, as such, *ultra vires*; and tending, as they do, to the creation of a monopoly, to the control of prices as well as production, these acts are also against public policy, and accordingly contrary to law."

In consequence of these decisions the trusts were obliged to reorganize, but they found no difficulty in changing their form without losing the advantages of unified control. In the year 1892 the Standard Oil Trust was dissolved, but immediately reorganized into twenty corporations, in all of which the former trustees held a majority of the stock, thus establishing community of interests between all the companies. One of those twenty companies, whose combined capital amounted to $102,233,700, was the Standard Oil Company of New Jersey, then capitalized at $10,000,000. On June 16, 1899, the charter of the company was amended, its capital increased to $110,000,000, and its new stock exchanged for the stock of the other companies, so that the trust finally became a single corporation, owning outright the property of all its former members. All of the early trusts have passed through a similar process of transformation. The American Cotton Oil Company was incorporated in New Jersey, in 1889, as a single corporation. The Sugar Refineries Company became the American Sugar Refining Company in 1891. The Distillers' and Cattle Feeders' Trust of 1887 became the Distilling and Cattle Feeding Company in 1890. In 1899 it became the Distilling Company of America, and in the year 1902 was formed the Distillers' Security Corporation, to acquire the stocks and property of the Distilling Company of America. In this way the "Whisky Trust" has become a "holding corporation," empowered under the lenient laws of New Jersey to hold and vote the stock of a large number of companies, controlling about 93 distinct plants. Among the other great holding companies are the Amalgamated Copper Company of 1899, the Consolidated Tobacco Company of 1901, and the United Steel Corporation of 1901, all organized under the laws of New Jersey. The fact that the holding company is incorporated appears to be the chief point of difference between it and the "trust." Since the Northern Securities decision of 1903 the legal position of the holding company has been considered uncertain, and the present tendency seems to be to prefer the actual merger or fusion. The General Corporation Act of New Jersey, revised in 1899, was especially designed to favor industrial consolidations, and most of them are incorporated under that law, so that the revenues of New Jersey are largely derived from fees and taxes paid by about 5500 corporations protected by its laws.

There are three different forms of industrial combination to which the name "trust"

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is commonly applied—the trust proper, the large single corporation, and the securities holding corporation. Besides these there are two other forms to which the name is somewhat more loosely applied—the pool and the "community of interests." The so-called "Beef Trust" is a pool, cartel or selling agreement, and not, strictly speaking, a fusion, consolidation or trust. It is evident, then, that the word "trust" is a popular expression and not susceptible of scientific definition. For practical purposes it is sufficiently accurate to define a trust as *any large combination of manufacturing interests formed for the purpose of controlling output and regulating prices.* It may be noted that this definition, in following common usage, includes industrial pools, but excludes railway pools and consolidations, as well as the great franchise corporations, such as the Western Union Telegraph Company, the American (Bell) Telephone and Telegraph Company, and the companies controlling municipal monopolies of various kinds.

The statistics of industrial combinations given in the report of the United States Census for 1900 are of little value, partly because of a narrow definition of the word "trust," and partly because of inaccuracy in the figures themselves. In one table the capitalization of trusts is given at $1,436,625,910, and the value of their annual product at $1,667,350,949. Now, since the total annual value of the products of manufacture, excluding hand trades, is given at $11,820,784,665, it is inferred that the trusts produce only 14.1% of the manufactures of the United States. The figures given by Moody are more reliable, and also more in agreement with common opinion. By including "pools" and "allied interests," Moody arrives at the conclusion that the total capitalization of the trusts of the United States is $6,717,791,533, and, including trusts in process of formation, the figures are $7,246,342,533. If these figures are correct, the annual product of the trusts must be about $8,000,000,000, or over 65% of the total product of manufacture, hand trades excluded. Seven of the greater trusts have a total capital of $2,662,752,100, distributed as follows: the Amalgamated Copper Company, $175,000,000; the American Smelting and Refining Company and affiliated corporations, $201,550,400; the American Sugar Refining Company and affiliated corporations, $145,000,000; the Consolidated Tobacco Company and affiliated corporations, $502,915,700; the International Mercantile Marine Company, $170,786,000; the Standard Oil Company, $97,500,000; the United States Steel Corporation, $1,370,000,000.

The development of trusts is an outgrowth of modern competition. Production on a large scale, with large quantities of fixed capital, aided by the railway, the telegraph, the telephone, stenography, typewriting, improved systems of bookkeeping, a highly developed organization of business, and a rapid improvement in methods of production, has made competition more severe than ever before, so that manufacturers have felt the need of some form of combination, to secure stability of business and protection against ruinous competition. For this reason pools have been formed for maintaining prices and regulating output. But pools do not eliminate the wastes of competition, such as undue cost of advertising, salaries of managers and travelling salesmen. Pools, also, are unstable and temporary, a source of much uncertainty and no little annoyance to all concerned. When possible, then, they tend to give place to the more stable organization of the fusion or trust. From the standpoint of cost of production, the trust has all the advantages of production on a large scale, together with the benefits of unified management and economical advertising. Besides these, there is often the power of controlling prices, with the monopoly profits resulting therefrom. It would seem, then, that the trusts have been formed chiefly for two reasons, which are really one: to prevent the losses due to unregulated competition and to secure the profits that come from fusion or consolidation. A noted case of this sort is that of the United States Steel Corporation, formed in 1901 largely because of threatened competition on the part of the Carnegie Steel Company. Among the secondary causes of the trust movement may be mentioned discrimination in railway rates, protective tariffs, control of patents, and the numerous favors granted on all sides to those who have power in the industrial world. The benefits of consolidation have often been exaggerated by unscrupulous promoters, who have formed trusts merely for the sake of selling inflated securities at excessive prices. A notorious instance of this occurred in the case of the United States Shipbuilding Company in 1902, in the promotion of which the worst features of trust finance were glaringly exhibited.

The principle of capitalization is the foundation stone of trust finance. Earning capacity of every kind is susceptible of capitalization, at a rate proportional to the security of the income. Ten competing companies may be earning 20% upon a given capitalization, and that capital, because of the disadvantages of competition, may be selling at par or less, but when these prosperous concerns are combined into a trust and their earnings are supposed to be more or less assured, the new company may be capitalized at double the former amount, and investors may be induced to buy the

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new securities at par, although they represent an earning capacity of only 10%. If, now, the earning capacity be increased through savings or by the profits of monopoly, it may be possible to capitalize the concern at three times the original amount and still float the securities at par, although no addition may have been made to the material capital invested. In such a case there is an enormous profit to be divided between promoters, underwriters and the original owners of the consolidated companies. In fact, the only limit to capitalization is the power of the market to absorb the inflated securities. In the financing of trusts it is not uncommon to issue three classes of securities: bonds, preferred stock and common stock. Bonds constitute a mortgage upon the whole or a portion of the plant, and usually bear interest at five or six per cent. Preferred stock receives dividends of seven or eight per cent. before anything is paid upon the common stock. Bonds and preferred stock should sell at par and usually represent a somewhat conservative capitalization of actual earnings. Common stock may represent only the hope of future earnings, and is often sold at a low figure or even given as a bonus to the buyers of preferred stock. Promoters and underwriters frequently receive their profits in the form of large blocks of common stock. Not all trusts are financed in this way. For example, the outstanding capital of the Standard Oil Company is $97,500,000, nearly all of which is common stock, whose market value, because of high dividends, is in the neighborhood of $650,000,000.

The trust movement, up to the present time, has been a mixture of good and evil. The original owners of the consolidated concerns have little cause for complaint, since they have usually received a good price for their properties. Owners of independent companies have sometimes become bankrupt, but have generally maintained their existence in alliance with the trust or without entering into destructive competition with it. Indeed, it seems probable that independent companies of moderate size can successfully compete with the powerful but somewhat unwieldy trusts. Promoters and underwriters as a rule have prospered. Speculators in stocks have gained and lost. The investing public has at times suffered severely from having bought securities at inflated prices. In April, 1901, the preferred stock of the United States Steel Corporation sold at 101, while the common stock sold at 55. In November, 1903, the preferred stock was quoted at 49 and the common at 10. In the same year there was a serious decline in the market value of all the new industrials. Since that time there has been a partial recovery. Thus, on June 13, 1905, United States Steel preferred sold at 94 and the common stock at 27. Because of dear experience, investors have become more cautious in their buying, and conservative promoters, for their own benefit, are disposed to favor sounder methods of corporation finance. When properly financed, "industrials" offer an attractive field for investment to capitalists large and small. From the standpoint of the consumer, the trusts have been of little benefit and some injury. The investigations of Jenks and others have shown that the trusts have frequently exercised monopoly power in the control of prices. While prices have seldom been raised, they have been kept from falling and the producers' margin of profit, between the price of the raw material and that of the finished product, has generally been increased when trusts have been established. That price-control exists may also be inferred from the fact that the leading trusts, with few exceptions, control in their several lines more than half of the total product of the United States, while the protective tariff strengthens their position by limiting the influence of foreign competition. The Standard Oil Company controls about 84% of the domestic product, the Consolidated Tobacco Company 90%, the United States Leather Company 65%, the Sugar Trust 70% to 90%, the Smelters' Trust 70% to 90%, the Steel Trust about 65%. The laboring men, as such, cannot complain that the trusts have reduced money wages, but they do assert, and with some reason, that the benefits of consolidation have accrued chiefly to the owners and promoters of the trusts and not to the laboring class in the form of higher wages, or a lower cost of the necessaries of life.

From the standpoint of general social welfare it is difficult to pass judgment upon the trusts. It is asserted that they tend toward a greater concentration of wealth, so that the independent middle class of manufacturers and merchants is being rapidly eliminated, and that they are the chief source of the political corruption which is threatening the very existence of American democracy. In opposition to these views it is maintained that the development of trusts is a necessary stage in industrial evolution, tending toward stability of business and the prevention of industrial crises and rendering a certain amount of public control not only desirable but possible. Doubtless there are evils as well as benefits connected with the trusts, but if we regard them as a product of evolution, it seems reasonable to suppose that the social forces which produced the movement will direct and control it toward the end of social utility and public welfare. Already certain checks are in active operation which promise to limit the development of the trusts and assign to them their proper place in the industrial system. As

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trusts increase in size they seem to lose in efficiency, making opportunity for the growth of smaller and more alert competitors. When they obtain monopoly power they must observe the principle of charging no more than the market will bear, else their profits will be reduced. If they earn excessive profits, potential competition becomes actual and endangers their supremacy. If they oppress or irritate the public they are likely to suffer from adverse legislation. They must be fair in their dealings with one another, or the harmony of business relations will be disturbed. They must pay good wages, or they will have trouble with the laboring men. They must keep within the law, or they will suffer from adverse decisions in the courts. In short, enlightened self-interest tends to prevent the worst excesses of monopoly power. There are also legislative and judicial checks, based upon a growing public opinion which demands regulation and control of all powers within the state. Gradually the legal system is becoming adapted to the new conditions. The English common-law doctrine that contracts in restraint of trade were illegal, did good service in early times, as in the celebrated case of Darcy *v.* Allein in the year 1602. Later the rule was somewhat relaxed, especially in the United States, where courts have approved of restraints of trade on the ground that they were reasonable (Hubbard *v.* Miller, 27 Mich. 15). More recent decisions show a tendency to enforce more strictly the ancient rule by condemning restraints of trade, whether reasonable or unreasonable (Northern Securities Company *v.* United States, March 14, 1903). This doctrine is applicable to loose combinations or pools, where several persons agree with one another to restrain trade, but it is hard to see how it can be applied to a fusion or trust, where a legal person agrees with himself to do certain things, but does not control the actions of another person. Thus, a railway pool is illegal because it is an agreement between several railway corporations to maintain rates (U. S. *v.* Trans-Missouri Freight Association, 166 U. S. 290), but a railway consolidation is a single corporation and may fix rates along its entire line, provided that they are not in themselves unreasonable. Similarly, it was declared illegal for manufacturers of iron pipe to combine and conspire to prevent competition in obtaining contracts (Addyston Pipe and Steel Company *v.* United States, 175 U. S. 211), but the United States Steel Corporation is not prohibited from conspiring with itself to control the sale of its products in any way it may please. The common-law doctrine, then, must receive a broader and more severe interpretation before it can be applied to control the monopoly power of trusts. But the principles of the common-law, as Clark and Goodnow have shown, may be enforced and perhaps extended to prevent the piratical methods employed by some trusts to ruin or coerce their unfortunate competitors.

Anti-trust laws have been passed by many states, but have proved ineffective, largely because of lack of coöperation between the states. The business of the trusts is so largely interstate in its character that no single state, without injury to itself, can adequately deal with the situation. The present tendency, therefore, is toward greater activity on the part of the Federal government. The Interstate Commerce Act of 1887 was designed to control, in some degree, the fixing of railway rates, and in this it has been partially successful. The "Anti-Trust Act" of July 2, 1890, was a further step in the direction of control of interstate trade. It declares that "every contract, combination in the form of a trust or otherwise, or conspiracy, in restraint of trade or commerce among the several states, or with foreign countries, is hereby declared to be illegal." This act, though directed against the trusts, has been enforced only against pools and chiefly railway pools (U. S. *v.* Trans-Miss. Freight Ass., 166 U. S. 290; U. S. *v.* Joint Traffic Ass., 171 U. S. 505; and Northern Securities Co. *v.* U. S., March 14, 1903). In the case of the Addyston Pipe and Steel Company, a conspiracy of manufacturers was held to be in restraint of interstate trade, and therefore illegal under the act. In two other cases (Hopkins *v.* U. S., and Anderson *v.* U. S.), decided in 1898, it was held that the acts of certain commission merchants and buyers of cattle in Kansas City were not in restraint of interstate trade. However, in a more recent case (U. S. *v.* Swift & Co. et al., 122 Fed. Rep. 529), decided in 1903, a United States circuit court held that the corporations constituting the so-called "Beef Trust" were guilty of conspiracy and combination in restraint of interstate trade. Similarly, a combination of manufacturers and dealers in tiles, mantels and grates has been condemned as acting in restraint of interstate trade (Montague *v.* Lowry, 193 U. S. Rep. 38). These cases apply only to pools and not to trusts. In the case of U. S. *v.* E. C. Knight & Co., it was held that the business of the "Sugar Trust" was essentially manufacturing in its character and not interstate commerce. The tendency, however, is toward a more severe interpretation of the act, and it is proposed to amend it so as to make it applicable not only to pools or loose combinations, but also to consolidations or trusts. The Interstate Commerce Act was amended in 1903, and it is likely that further action will be taken to prevent those discriminations in railway rates which

have been so powerful a factor in the building up of the trusts. The investigations of the Industrial Commission have supplied much information valuable to specialists, legislators, and the general public. The establishment of the Department of Commerce and Labor in 1903 was a step in the direction of governmental regulation. James B. Dill and others have suggested that the trusts might be permitted or even required to be incorporated under Federal law. James R. Garfield has suggested that they be required to obtain a Federal franchise or license for permission to engage in interstate commerce. Foreign observers are quick to note that the Federal form of government presents serious obstacles in the way of governmental control, and frequently suggest that it will be necessary to amend the Constitution before effective control can be secured. More conservative writers favor tariff reform as a convenient means for limiting the monopoly power of the trusts. From all sides comes a demand for publicity, that the general public may be enlightened concerning the essential facts of this most difficult problem.

The trust problem, if such may be said to exist, is, like any other problem of human life, in process of being worked out by interaction of all the forces in the social organism. These forces are directed chiefly by the economic interests of the various classes of which society is composed: landowners, investors, promoters, manufacturers, merchants, farmers and laborers, all of whom are, in a sense, both producers and consumers, and, as such, vitally interested in securing a fair share in the product of their common industry. All of these interests are organized to a greater or less degree, while over against them is the political and legal organization of the state, representing, potentially, at least, the interests of the common people. It seems probable, then, that the trusts, representing only a part of the capital of the country, will not be allowed to dominate the industrial situation, and that conflict and compromise between the various organized interests will secure the greatest possible social welfare to all concerned.

Trusts exist in the United Kingdom and on the Continent of Europe, but to a less extent than in the United States. In Germany, France and other continental countries, the cartel or pool is more common than the fusion or trust. These cartels are generally organized in the form of selling syndicates, and exercise considerable control over output and prices. Their power is rather limited, so that there is little popular agitation against them and their contracts have sometimes been recognized and enforced by the courts. Among the chief commodities controlled are coal, iron and steel, chemicals, papers, leather, and petroleum. Protective tariffs doubtless facilitate the formation of cartels. In the United Kingdom, as in the United States, trusts are more common than on the Continent, perhaps because of the higher industrial development of these two countries, or possibly because of the prejudice of English peoples against a paternal form of government and interference with individual liberty. The capitalization of some of the chief British trusts is as follows: the Coats Cotton Thread Combination, £10,000,000; the Bradford Dyers' Association, £4,225,000; the Bleachers' Association, £6,791,000; the Calico Printers' Association, £8,226,000; the Imperial Tobacco Company of Great Britain, £14,518,000; the Associated Portland Cement Manufacturers, £6,349,000. The power of these trusts over output and prices appears to be less than that of the leading American trusts, probably because of the absence of protective tariffs. There is also less inflation of capital and less unscrupulous promotion, largely because of a uniform and somewhat strict Companies Act, amended in 1900. Still better conditions exist in Germany, where promoters are held to strict account under the excellent Company Law of 1884. There are a few international trusts, such as the Nobel Dynamite Trust, with a capital of £9,600,000; the International Nickel Company, $27,483,012; the Borax Consolidated Company, £3,200,000; the Coats Company and allied interests; and the De Beers Mining Company, controlling the diamond fields of South Africa and the price of diamonds throughout the world.

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JAMES EDWARD LE ROSSIGNOL.

**Truxillo.** See TRUJILLO.

**Truxtun, Thomas,** an American naval officer; born in Long Island, N. Y., Feb. 17, 1755. He was made a lieutenant in

the navy, and in 1775 was assigned to the command of the "Congress," the first of the American privateers equipped for service during the Revolutionary War. In 1776 he captured several prizes in the West Indies, and the following year took command of the "Independence" with which he took a number of prizes, including one more heavily armed than his own vessel. Later he equipped the "Mars" with 20 guns and cruised the English channel, doing much damage to British merchant marine. In 1781 he was assigned to the "Commerce," with which he defeated a British vessel with 32 guns. In all of his engagements with the enemy he was uniformly victorious. In 1798, when the United States navy was organized, he was selected as one of its six captains, and was placed in command of the "Constellation," and was ordered to protect American commerce in the West Indies. In February, 1799, he fought a severe battle with the powerful French ship "L'Insurgente" and captured her after killing 29 of her crew and wounding 44. In recognition of this service a number of London merchants forwarded him a plate valued at 600 guineas. In January, 1800, he defeated the French frigate "La Vengéance," and for this achievement received a gold medal and thanks from Congress. In 1802 he was assigned to command a fleet to participate in the war with Tripoli, and went to Norfolk to join the "Chesapeake." About the same time he requested the appointment of a captain for his flagship. His letter was taken to mean his resignation, which was accepted against his wishes. He was the author of "Remarks, Instructions, and Examples Relating to Latitude and Longitude" (1794). He died in Philadelphia, Pa., May 5, 1822.

**Trygon,** in ichthyology, the sting ray; the type genus of *Trygonidæ*. Tail very long, tapering, armed with a long arrow-shaped spine, serrated on both sides; body smooth or with tubercles; nasal valves coalescent into a quadrangular flap; teeth flattened. Some 25 species are known, chiefly from the tropical parts of the Indian and Atlantic Oceans, though some are from the fresh waters of E. tropical America. *T. pastinaca,* the common sting ray, extends from the S. coast of England and the E. coast of North America through the Atlantic and Indian Oceans to Japan. It lives on shallow, sandy ground, rarely takes the bait, and is commonly caught by accident in nets. The flesh is red, and is said to have a rank flavor.

**Tryma,** a compound fruit, superior by abortion, one-celled, one-seeded, with a two-valved indehiscent endocarp, and a coriaceous or fleshy, valveless sarcocarp. Example, the fruit of the walnut. The term has been deemed superfluous, and it has been proposed to call the fruit of the walnut a magma, or even a drupe.

**Tryon, Sir George,** a British naval officer; born in 1832; entered the navy in 1848; was at Sabastopol; became captain in 1866, and admiral in 1884. He was commander-in-chief on the Australian station in 1884–1888, and in the Mediterranean from 1891 till the disastrous collision (June 29, 1893) off the coast of Syria, when his flagship, the "Victoria," by his mistaken order, collided, capsized, and sank with her commander and great part of her crew.

**Tryon, George Washington,** an American conchologist; born in Philadelphia, Pa., May 20, 1838; was educated at the Friends' School of Philadelphia; engaged in business till 1868; then gave his attention to the study of conchology. In 1865 he originated the movement for the construction of the present edifice of the Philadelphia Academy of Natural Sciences. Toward this purpose he contributed $3,000, and the conchological department gave a like sum. He became curator of the Academy in 1869 and had charge of the arrangement of the library and the many collections of the museum in the new building. In 1865–1871 he was the editor of the "American Journal of Conchology." His publications include "Synopsis of the recent Species of Gastronchænidæ" (1861); "Monograph of the Order of Pholadacæ" (1862); "Monograph of Terrestrial Mollusks of the United States" (1865); "Land and Fresh-Water Shells of North America" (1873); American Marine Conchology" (1873); "Structural and Systematic Conchology (3 vols. 1882); "Manual of Conchology" (12 vols. 1879–1885); etc. He died in Philadelphia, Pa., Feb. 5, 1888.

**Tryon, William,** a British colonial governor; born in Ireland, about 1725; joined the British navy and as an officer did creditable service. Through the influence of the Earl of Hillsborough, a relative of whom he married, he was made lieutenant-governor of North Carolina in June, 1764, and became governor in July, 1765. He put down the revolt of the "Regulators" in that colony, and was exceedingly cruel to the prisoners. The assembly of North Carolina voted $15,000 with which a beautiful residence was erected for him in Newbern. In 1771 he was made governor of New York. The patriots detested him on account of his arbitrary rule and especially for the cruelty he manifested in the destruction of Fairfield, Danbury, and Norfolk, Conn., expeditions against which he personally conducted. He relinquished the office of governor in 1778, and returned to England. He was promoted Major-General in August, 1777, and Lieutenant-General in

November, 1782. He died in London, England, Feb. 27, 1788.

**Trypanæus,** in entomology, a genus of *Histeridæ;* small beetles, with a triangular head and a mouth adapted for boring. They fix themselves on the trunk of a tree denuded of its bark, and, revolving after the manner of a gimlet, bore holes into the wood.

**Trypanosomata,** in zoölogy, an order of *Infusoria Flagellata;* endoparasitic animalcules, flattened or lamellate, one or more of the lateral borders forming a frill-like undulating membrane, by the vibrations of which progress is effected; one extremity sometimes attenuate, and somewhat resembling a flagellum; oral or ingestive area undefined. The order contains a single genus, *Trypanosoma,* with two species: *T. sanguinis,* found in the blood of frogs,. and *T. eberthi,* from the intestines of domestic poultry.

**Trypauchen,** in ichthyology, a genus of *Gobiidæ,* with three species, from the coasts of the East Indies. Body elongate, covered with minute scales; head compressed, with a deep cavity above the operculum on each side (whence the generic name) ; one dorsal, continuous with anal and caudal, ventrals united.

**Trypeta,** in entomology, a very large genus of *Muscidæ;* small flies, with transparent wings covered with dark spots. They frequent the *Compositæ;* the larvæ feed on the substance of the plant, often producing gall-like excrescences.

**Trypethelium,** in botany, the typical genus of *Trypethelidæ.* The thallus produces a number of distinct pustules, with uninerved perithecia containing a gelatinous nucleus producing asci and sporidia. Generally from tropical and sub-tropical climates.

**Tsabaism.** See SABBIANISM.

**Tsana.** See DEMBEA.

**Tsarskoe Selo** ("imperial town"), a town of Russia, province of St. Petersburg, 18 miles S. of the capital. It contains eight churches and two palaces, the principal summer residences of the imperial family. The larger of these, built by Elizabeth in 1744, and embellished at greater expense by Catherine II., is a noble building, though overladen with false ornament. It has a frontage of 782 feet, and contains a ball room 141 feet long and 50 feet broad. In one of its wings is a marble gallery 270 feet long by 28 wide, with a noble Ionic colonnade adorned with bronze busts of the most famous men of antiquity. The great park, one of the most carefully planted in Europe, contains a Turkish kiosk, a Chinese hamlet with a pagoda, a bridge built of Siberian marble over a canal connecting two lakes, a marble statue of Count Orlof, and the artificial ruins of a Gothic castle, in the chapel of which stands the marble statue of Christ by Dannecker, erected in 1824 by Maria Feodorovna at a cost of 30,000 rubles. In the armory is a large collection of armor, weapons, dresses, and relics of historical persons, while the model farm contains Tyrolese, Swiss, and Dutch cattle, besides buffaloes and bisons. N. W. of the town is Pulkowa, the central Russian observatory. Since 1841, Tsarskoe Selo has been the scene of great annual horse races. Pop. about 23,000.

**Tschaikowsky, Peter Iltitsh,** a Russian composer; born in Wotkinsk, Russia, in 1840; was educated at the School of Jurisprudence in St. Petersburg; received an office in the Ministry of Justice in 1859; turned his attention to music in 1862; and studied in the Conservatoire of Music till 1865. He was Professor of the History of Music. Harmony, and Composition in the Conservatory of Moscow in 1866-1878, and afterward applied himself to composition. His works include the "Enchantress," "Vakula," "Opritchnik," and several ballets and operas, six symphonies, and many concertos, symphonic poems, suits, etc. He died in St. Petersburg, Nov. 7, 1893.

**Tscheffkinite** (after the Russian General Tschevkin, or Tscheffkin), a very rare mineral, only a few specimens being known, one of which is in the collection of the British Museum (Natural History). Amorphous; hardness, 5-5.5; sp. gr. 4.508-4.549; luster, vitreous; color, black; streak, dark-brown; opaque. Composition: A silco-titanate of lanthanum, didymium, cerium, sesqui- and protoxide of iron, and lime. Found in the Ilmen mountains, Urals, Russia.

**Tschermakite** (after Dr. G. Tschermak, of Vienna, mineralogist), a massive mineral, showing two cleavages inclined to each other at an angle of 94°; hardness, 6.0; sp. gr. 2.64; color, grayish to white; luster, vitreous, phosphorescent. An analysis gave: Silica, 66.57; alumina, 15.80; magnesia, 8.00; soda, with a trace of potash, 6.80; water, 2.70 = 99.87, which gives the formula, $3ROSiO_2 + Al_2O_3,2SiO_2$. This has been lately shown to be probably an analysis of impure material, and as Des Cloizeaux has determined the optical properties to correspond with those of albite, the later analysis of Pisani, which is near that of this mineral, suggests that the substance is but albite.

**Tschermigite** (after Tschermig, Bohemia, where found), a member of the group of alums, in which the potash is represented by ammonia; crystallization isometric, occurring in octahedrons, and fibrous; hardness, 1-2; sp. gr. 1.50; luster, vitreous;

color, white, transparent to translucent. Composition: Sulphate of ammonia, 14.6; sulphate of alumina, 37.8; water, 47.6 = 100, whence the formula, $NH_4OSO_3Al_2O_3 + 3SO_3 + 24H_2O$. Manufactured and extensively used in place of potash-alum

**Tschudi, Egidius,** or, as he wrote himself, **Gilg Schudi,** the father of Swiss history; born in Glarus in 1505, of a family of which several members were distinguished in war, politics, and science. He studied under Glarean in Basel and Paris; was in 1533 and 1549 high baliff at Baden, and for some time a captain in the French service; afterward traveling much among the Swiss mountains in search of materials for his historical studies. He several times acted as a mediator in the religious disputes of his time, but himself continued a Roman Catholic. In 1558 he became "Landammann" of Glarus; in 1559 was envoy to the Kaiser Ferdinand I. The chief of his numerous historical works is the "Chronicon Helveticum," embracing the period 1000–1414. The dramatic descriptions of this book Schiller declared to be "both homely and Herodotean, nay Homeric," and used amply in giving local color to his "Wilhelm Tell." Rilliet notes that it was Tschudi who first gave precision to the circumstances, dates, and persons of the Tell legend. Many unpublished MSS. of Tschudi are preserved in the libraries of St. Gallen and Zürich. He died in Glarus, Feb. 28, 1572.

**Tschudi, Johann Jakob von** (tshö'dē), a Swiss naturalist; born in Glarus, Switzerland, July 25, 1818. He traveled extensively in South America in 1838–1843, and again in 1857–1861. He wrote: "The Kechua Language" (1853); "Peru: Sketches of Travel" (1846); "Peruvian Antiquities" (1851); "Travels in South America" (5 vols. 1866–1860. He died in Jakobshof in Lower Austria, Oct. 8, 1889.

**Tsech,** or **Czech,** a branch of the Slavic race, inhabiting Moravia and Bohemia.

**Tsehong,** a red pigment used by the Chinese for painting on porcelain. It consists of a mixture of alumina, ferric oxide, and silica, with white lead.

**Tsetse,** the native name of *Glossina morsitans,* a dipterous insect, slightly larger than the house fly, from Africa, ranging from 18°–24° S. latitude. It is brown, with four yellow transverse bars on the abdomen, beyond which the wings project considerably. According to Livingstone — who in one of his journeys lost 43 oxen by the attacks of this insect — its bite is almost certain death to the ox, horse, and dog, but innocuous to man, the ass, the mule, and to wild animals generally. The head is armed with a proboscis adapted for piercing the skin, and the fly lives by sucking blood. At first no effect is perceived, but in a few days after an ox has been bitten, the eyes and nose begin to run, the coat bristles, a swelling appears under the jaw, and sometimes at the navel, emaciation and flaccidity of the muscles ensue, followed by

TSETSE.
a, natural size.

purging, staggering, in some cases madness, and finally death. On dissection the cellular tissue under the skin is found to be injected with air, as if a quantity of soap bubbles were scattered over it.

**Tsinglien,** a red color used for porcelain painting in China, consisting chiefly of stannic and plumbic silicates, together with small quantities of oxide of copper, or cobalt and metallic gold.

**T-square,** a draughtsman's ruler; so named from its resemblance to the letter T. The blade is set at right angles to the helve, and the latter slips along the edge of the drawing board, which forms a guide. The helve is made of two parallel pieces, in one of which the blade is mortized. The other portion of the helve is adjustable on the set screw to any angle, so as to rule parallel oblique lines, or to form an oblique base for the triangles, which are the usual rulers in plotting and projecting. To some T-squares is attached a shifting member on one side of its tongue, so as to give the latter any angle with the base line of the drawing. The tangent screw and protractor admit accurate angular adjustment.

**Tuamotu Islands, Paumotu,** or **Low Archipelago,** an extensive group of islands in the Pacific, lying E. of the Society Islands and S. of the Marquesas; mostly under French protection. They export pearls, mother-of-pearl, trepang, etc. Pop. about 7,000.

**Tuaregs, Tuaricks,** or **Tawarek,** a nomadic race of Berber origin inhabiting the Sahara between lon. 5° W. and 13° E., and across its entire breadth. They are the finest of the Sahara races, being handsome and powerfully made, but are fierce and are perpetually at war among them-

selves. They profess Islamism, but are more influenced by pagan superstitions. Their women go unveiled, and take part in public affairs. No reliable estimate of their numbers can be formed. Tuaregs is a name of Arabic origin, and Imoshagh is the name by which the Tuaregs designate themselves. They appear to be a race dating from remote antiquity, and Barth identifies them with a people figured on the Egyptian monuments.

**Tuatera,** the native name of *Sphenodon punctatum,* a large lizard from New Zealand; olive sides and limbs with minute

TUATERA, OR NEW ZEALAND LIZARD.

white specks, beneath yellowish; the spines of the nuchal and dorsal crests yellow, of the caudal brown; the scales of the back, head, tail, and limbs small, granular, nearly uniform; with irregular folds in the skin, which are fringed at the top with a series of rather larger scales; an oblique ridge of larger scales on each side of the base of the tail, and a few shorter longitudinal ridges of rather smaller ones on each side of the upper part of the tail. The tuateras are apparently carnivorous, and in captivity are fed on raw meat, living frogs, small lizards, earthworms, mealworms, snails, young birds, or mice. The tuatera is remarkable as being the only living representative of the order *Rhynchosauria,* and it was in the tuatera that the parietal or unpaired eye was first observed.

**Tuba,** in music, a brass wind instrument, the lowest as to pitch in the orchestra; it has five cylinders, and its compass is four octaves. Also, a high pressure reed stop of eight foot pitch on an organ; called also tuba mirabilis, tuba major, tromba, or ophicleide.

**Tuber,** in botany, an underground fleshy stem or appendage to the root, being usually an oblong or roundish body, of annual duration, composed chiefly of cellular tissue with a great quantity of amylaceous matter, intended for the development of the stems or branches which are to spring from it, and of which the rudiments, in the form of buds, are irregularly distributed over its surface. Examples are seen in the potato, the Jerusalem artichoke, and



arrowroot. Tubers are distinguished, according to their forms, into didymous (in pairs), palmate (hand-like), fasciculate, globular, oblong, etc.

GREEK SOLDIER WITH A TUBA.

**Tubercle,** a small tuber; a warty excrescence; in pathology, a growth usually taking the shape of minute round masses, and developing in the lungs, intestines, larynx, etc., of persons of scrofulous constitution. It is described by pathologists as being of two kinds, the grey or miliary, and the yellow or crude; but the latter is, strictly speaking, a secondary form of the former. Grey, or miliary tubercle, is "a greyish-white, translucent, non-vascular body, of firm consistence and well-defined spherical outline, usually about the size of a millet seed. Though in its earlier stage it is uniformly translucent, its central portions quickly become opaque and yellowish, owing to the retrograde metamorphosis of its component elements. In structure tubercle, like the other lymphomata, consists of lymphatic cells contained in the meshes of a very delicate reticulum. The cells are mostly round, or roundly oval, colorless, transparent, and slightly granular bodies, much resembling lymph corpuscles; and, like these, varying considerably in size. Many of them contain a small distinct nucleus. In addition to these are a few larger cells, containing two or even three nuclei." Masses of tubercle may be intersected by vessels belonging to tissues interposed between the component parts of the mass, which softens into a yellow caseous substance, called the yellow or crude tubercle. Mixed with these masses of tubercle there are also "ill-formed epithelial cells, masses of pigment, crystals and plates of cholesterine, remnants of enclosed and disintegrating tissue, which break down and involve the neighboring tissues, forming strumous abscesses and ulcers. In some cases the pro-

cess of softening commences in the tubercular mass, and involves the tissues secondarily; in other cases the softening or inflammation commences in the neighboring tissues, and gradually invades the tubercles; or the latter may harden, leaving a hard chalky mass called the cretaceous tubercle. In some cases this mass may remain innocuous; but it may give rise to suppuration and be thrown off, a condition frequently met with in phthisical patients.

Pathologists are divided in opinion as to whether there is anything essentially peculiar in tubercle, or if it is merely a form of chronic inflammatory deposit. The researches of recent physiologists have shown that by the inoculation of non-tubercular products, or by artificial irrigation of the tissues in the lower animals, products undistinguishable from tubercle may be generated. If these experiments are applicable to man, the deposit of tubercle may be regarded as only a more definite form of chronic inflammatory lymph, or as a degraded condition of the nutritive material from which old textures are removed and new ones formed, differing in its origin from the normal plasma or coagulable lymph, not in kind, but in degree of vitality and capacity of organization. Others, however, maintain that tubercle is essentially a morbid product, as distinct as cancer, and that its development depends on a peculiar diathesis, viz., the strumous, scrofulous, or tubercular diathesis.

Tuberculosis, in the human subject, may depend on the development of tubercle as a primary, morbid product, or it may be the result of some exhaustive, suppurative lesion. Tuberculosis, or the tubercular diathesis, is, according to Sir W. Jenner, a form of the strumous diathesis, the leading pathological changes of which are fatty degeneration of the liver and kidneys, deposits or formations of tubercle and their consequences, inflammation of the serous membranes.

It has long been firmly believed in Italy that tuberculosis is contagious; and there are instances in which it would appear to be communicable, especially in crowded ships, barracks, and rooms. Dr. Farr says: "The presence of phthisis in the armies of Europe is probably due, in fact, to the inhalation of expectorated tubercular matter, dried, broken up into dust, and floating in the air of close barracks."

Tuberculosis is undoubtedly, in some instances, a hereditary disease, the germs of which are born with the individual, and ready to be developed on the least exciting cause; but it is very doubtful whether it is generally so, and we believe that this influence has been very much exaggerated. Impure air, density of population, and overcrowding, have much to do with its development. Drs. Bowditch and Buchanan, by independent investigation, established the fact that there is a decided relation of cause and effect between dampness of soil and consumption. According to Dr. Andrews, of the Chicago Medical College, tuberculosis is most abundant near the sea, and diminishes as we recede from it. At equal distances from the sea it prevails at the N. and diminishes toward the S. See CONSUMPTION.

**Tuberculosis.** Of the diseases known to man, tuberculosis has been most far-reaching in its devastation. Cholera, plague, yellow fever, and smallpox have been more terrible in their ravages but have been periodical only. Leprosy, the only disease comparable with tuberculosis in its damage to the human race, has been practically extinct in civilized countries for at least two centuries. Indeed, the human mind cannot grasp the full significance and scope of tuberculosis in sorrow, suffering and deprivation. Some think it is a modern affliction which has come upon us because of the degenerating influences of civilization. This is not true. Moses knew of it as we know it; he had seen its deplorable work among the Egpytians. Even in that day it was looked upon as a plague. Back of the days of Moses we can trace its bone-strewn path to the Assyrians and we can see shadows of it in the dim vista of the unrecorded past. The truth is that tuberculosis is less prevalent now than at any time within the purview of history. But it is still a monster.

Few know what tuberculosis really is. Even physicians overlook it in some of its forms other than full-fledged consumption. In the latter form the victim has a bad cough, is emaciated and dies from what seems to be starvation. In some forms of the disease the patient dies with acute symptoms pointing to a disease of organs other than the lungs and the death appears on the records under names other than tuberculosis.

The features about tuberculosis which are of greatest interest to the public at large are its contagious nature, its curability and its prevention. Carefully interwoven with these are certain errors which remain to be blotted out of the public mind and intelligence. These errors relate to heredity, incurability and the relationship between cold and consumption.

In order to get a clear idea of what is meant by contagion of tuberculosis, one must first have a clear conception of what contagion means. All diseases which are due to living organisms of any kind whatsoever, are, by the nature of things, communicable from one person to another. The word communicable conveys an abstract idea but tells nothing of the method by which

the disease is communicated. Science has demonstrated that different diseases are communicated in different ways and has divided them broadly into two classes, contagious and infectious. A contagious disease is one in which the disease-producing organism goes direct from the person having the disease to a person who has not the disease, without passing through an intermediary host or medium. For example, tuberculosis is a contagious disease, because the tubercle bacillus when given off by the person having the disease, lies dormant in the sputa or matter given off, until by chance it finds its way into some other person. The bacillus cannot reproduce itself outside of a host. It must, moreover, be taken in by the host himself, either with food or with air. Malaria, on the other hand, is an infectious disease, because the organism which produces it is taken from a host by the mosquito, reproduces itself in the mosquito and is transmitted by the mosquito to a human being who may never have been in contact with the person by whom the original organism was given off. Briefly stated, a contagious disease requires contact, direct or indirect, between the person who has the disease and the person who is to receive it; whereas an infectious disease does not require contact, either direct or indirect, between the new and the old host.

Tuberculosis is purely and essentially a contagious disease and the contact necessary for the conveyance of the disease must be intimate and prolonged. Mere casual relationship with a consumptive is practically free from danger. There is no danger of contracting the disease upon the street and very little danger in public places, street cars and railway cars. In none of these places is the exposure long enough to produce an implantation and in most of them the sunlight, air, moisture and trituration produced by the activities of life conspire to destroy the vitality of the organism. For the implantation of the tubercle bacillus and the development of a colony in a new host, it is usually necessary to undergo some such intimate and prolonged exposure as is possible in the home of the consumptive, in his place of business or occupation, and in the house which has been occupied by him and has thereby become contaminated, holding on its walls and floors for days, weeks, months and years, the living organism.

Tuberculosis has been looked upon till very recently as an incurable disease and even now is regarded as such by the laity and many in the profession. This is because of the traditions which have come down from the days when the disease was incurable and of the reluctance with which men accept ideas which are contrary to that which has been taught them in their youth.

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In a measure it is also due to the fact that the disease is seldom recognized until, in its progress, it has passed the curable stage. Under modern methods of treatment the disease can be cured almost invariably in the first stage, and can be cured frequently in more advanced stages. To express the curability of tuberculosis in figures, it may be stated that 75 per cent. of incipient cases and 40 per cent. of all cases exclusive of the dying ones can be cured.

The method of treatment by which these results can be accomplished may be briefly summed up as follows: First, proper use of an abundance of easily digested food; second, a proper life in the open air; and, third, such medication as will aid the forces of nature in their battle against the disease. It goes without saying that this method of treatment is within the reach of but few, and that if it is to be accorded to the rank and file, the aid of both the government and of private charity must be invoked to the fullest degree. For the poor and even for the middle class, sanatoria are necessary. Agitation is going on throughout the civilized world for the establishment of such sanatoria and much has already been accomplished in this direction in some of the European countries. In America the public has not yet been aroused to a full sense of its duty in this regard. Beginnings have been made, however, and the leaven will spread. Nowhere in the world does an appeal for a worthy charity find a more ready response than here, and it needs no prophet to foretell that when our people understand the subject America will not be a laggard long in the work which means so much to the human family.

So far but few sanatoria have been established in this country by the Federal and State governments. Two have been instituted by the United States for its tuberculous marines and soldiers, and one by the State of Massachusetts for people who can contribute in part toward defraying the expenses incurred in their treatment. The State of New York has taken preliminary steps toward founding a sanatorium, and the State of Pennsylvania has encouraged the establishment of such institutions by appropriating money to private corporations for that purpose. Fully half a dozen legislatures have at present under consideration bills for the establishment of sanatoria. The government of Canada has passed a general law facilitating the establishment of sanatoria by local governments, and under this law one successful sanatorium is in operation. All of this is scarcely worthy of being considered a beginning, in view of what remains to be done. We have in the United States alone, somewhere between 100,000 and 200,000 cases of incipient tuberculosis. We have an equal number of advanced cases. Nearly all the incipient

cases could be cured if sanatorium treatment were available. This number gives some idea of what remains to be done in the establishment of sanatoria. But besides making provision for the incipient cases, there is the task of providing proper treatment for cases which have advanced beyond the incipient stage, many of whom have passed beyond the threshold of hope, but some of whom might yet be cured if the proper help could be extended to them. For such cases institutions of two kinds are necessary. For the hopeless cases, special hospitals should be erected in cities and towns; general hospitals, quite properly, do not care to take such cases, and indeed, are not equipped for their treatment. Dying consumptives, during the last two or three months of their lives, need nursing, special diet, and above all, the kind, sympathetic care which can be given only in an institution equipped for that purpose. Persons who, having passed the incipient stage, have a just hope still remaining, should be placed in a hospital near some large city, built specially for the purpose of treating tuberculosis. Here again the equipment of a general hospital falls short; for good and sufficient reasons, general hospitals decline to accept such cases. Moreover the treatment of such cases requires expert knowledge which can best be had in large cities.

The prevention of tuberculosis opens up the most interesting and enticing field of labor for the philanthropists that has ever fallen to the lot of man. To be able to stamp out a disease which has brought so much unhappiness to the human race, which has blighted so many hopes, which has deprived the world of so much that is good and beautiful, is a privilege almost beyond the ambition of a human being; and yet the accomplishment of such a work is within the power of the rising generation. That tuberculosis can be stamped out, no longer permits of doubt. Leprosy was stamped out by empirical methods and without the aid of science. Tuberculosis can be eradicated more easily, because science has given us knowledge of the life history of the organism which produces the disease, thereby enabling us to know just what to do.

Were the means at hand to place every case of tuberculosis either in a sanatorium or in a hospital the disease could be stamped out in a few years. It is plain enough that, for every case of incipient tuberculosis that is placed in a sanatorium at least one new case must be prevented, because the disease in the incipient stage is not contagious; and the case being removed before contagion sets in, from where contact with it can take place, no contagion can ensue. When cases which have advanced to the breaking down or contagious stage are removed into hospitals or sanatoria, prevention of contact is brought about only from the time of such removal; but as the most dangerous time in the life of the consumptive is during the latter part of the disease when he expectorates freely, is confined to the house, and is too weak to observe habits of cleanliness, removal to a hospital where sanitary measures can be enforced will accomplish, at this stage, a great deal in preventing the spread of the disease. It would, moreover, in some degree prevent the contamination of rooms and buildings — a prolific source of contagion.

It goes without saying that sanatoria and hospitals for all cases of tuberculosis cannot be established at once, and that the founding of institutions with capacity for even a fair proportion of the cases which exist will take years. In this light the task of stamping out tuberculosis at first glance looks like a hopeless undertaking. But it is not. It must be borne in mind in this connection that every case which is prevented has a progressive value in the scheme of prevention for all time to come; not only is that case prevented, but, likewise, all cases which might have grown out of it. Besides, much can be accomplished by other preventive measures. Boards of health can do a great deal. Every case of tuberculosis in the land can be made harmless, at least theoretically speaking; but here again comes in the question of practicability. The contagion of tuberculosis lies in the sputum, or matter given off. It exists nowhere else. This sputum, or matter, is visible and tangible. It can easily be disinfected, therefore, immediately upon being given off. When this is done, no harm can come to those who are intimately associated with the person giving it off. If boards of health were cognizant of the whereabouts of every case of tuberculosis in their respective communities, and would give individual instruction with brief supervision to every case, in methods of disinfecting the *contagium*, successful prevention could be instituted with many cases — practically with all cases except the depraved and the vicious. Registration of tuberculosis is, therefore, the first step necessary in an intelligent scheme to stamp out the disease. A hue and cry has been raised against registration. Intelligent physicians in high standing have spoken and have written against it. Why? Wholly because of misunderstanding and false sentiment. The methods in vogue of quarantining against diseases which are registered, are so heartless, so obsolete, and so useless, that many conscientious, experienced physicians feel in duty bound to place themselves as barriers to any further inroads upon the sacred rights and liberties of the individual by the majesty of the law.

It is a pity that our legal machinery for caring for the public health has been so

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badly planned and built and, by its operation, has lost the moral support of the profession upon which it must chiefly rely for assistance. But no one will gainsay the proposition that the shortcomings of boards of health, as constituted and managed, do not give a good and sufficient reason for opposition to a measure which has for its object the saving of human life, and is reasonably certain of accomplishing that object. Besides, in the nature of things, the quarantining methods which prevail for diseases now registered have no place in a scheme for the prevention of tuberculosis. What object could there be in restricting the liberties of a consumptive, when by proper instruction and training he can be made harmless?

Here comes in the most plausible argument of the opponents of registration. Why have registration, if the consumptive can be made innocuous so easily; why not leave it to the attending physician to instruct and train him? The answer to this argument is, that in a very large proportion of advanced cases no physician is called in till a few days before death; and in those cases in which there is a physician in attendance, he, as a rule, fails to give the instruction and training requisite for successful prevention.

It is to be regretted that much of the energy which, so far, has been let loose and that much of the money which has been expended for the prevention of tuberculosis have been turned into wrong channels. Expensive government departments have been created and millions of dollars have been expended in attempts to prevent the domestic cow from giving tuberculosis to human beings, though it has been well known for years, in the medical profession at least, that the testimony upon which the cow has been convicted of giving tuberculosis to human beings was inadequate. At best the case against the cow has been a negative one. She has tuberculosis and man has tuberculosis. She has never been able to prove that she does not give the disease to man; and, as man eats her flesh and drinks her milk, it is quite clear that he must get the disease from her. The fact that it has been proved that man gives the disease to her is quite naturally used against her, because, by analogy, if man can give the disease to her, she must be able to give it to man. Clinically, there is no evidence against her. The first indisputable case in which tuberculosis in a human being has been contracted by the use of milk or meat is yet to be placed on record. A few cases have been recorded in which milk seems to have been the source of origin of the disease; but all of them are open to the criticism — so far, at least, as the record goes — that contagion from human beings could not be excluded.

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It would be presumptuous to say that tuberculosis cannot be conveyed from animals to human beings; because what appear to be authentic cases of accidental inoculation of human beings with animal tuberculosis are on record. But it can be said safely, that practically, tuberculosis is seldom if ever given to human beings by the use of the milk and the meat of the cow as food.

Of the popular errors about tuberculosis which merit consideration, heredity stands first. The world has looked upon tuberculosis as a hereditary disease for so long a time, and the literature of the world — and, indeed, all human thought and habits of life — are so permeated with the idea, that it is difficult for the average person to take up other views on the subject and to mold his thoughts and shape his conduct accordingly. We can now easily understand why our forefathers were misled. Tuberculosis being an insidiously contagious disease, long in incubation and slow of development, quite naturally spread along the lines of family relationship, and proceeded along those lines till the family became extinct or till immunity had been established. It was the slowness of the disease and the long period of intervention between cases that misled. With our knowledge of the life history of the tubercle bacillus and of the solid requisite for its implantation and cultivation, the stumbling blocks of our forefathers resolve themselves into thin air. The strong argument for heredity which was forged out of the extinction of whole families by the disease, the overleaping of generations with reappearance of the disease in members of the family resembling ancestors who had had the disease, and death by the disease in different members of a family at the same age, gives place in the new light to a stronger argument for contagion forged out of the same material.

The extent to which heredity really affects tuberculosis is limited within the confines of predisposition on the one side and immunity on the other. There is a fundamental law governing all living organisms, by which a certain, definite soil is required for development and propagation, the soil being governed by the influences of environment, and showing a tendency and disposition to wear out. This law is illustrated in the wheat field. The farmer knows that unless he has a proper soil his wheat will not grow and fructify, and that, even when he has a proper soil, there is a limit to the number of consecutive crops which he can raise from it. When the soil is exhausted he can restore it by adding certain ingredients and allowing it to lie fallow for a time, but if he exhaust it beyond a certain point it is difficult to restore it to a condition which will permit him again to grow wheat. Originally, the whole human race

was probably good soil for the tubercle bacillus. This soil was transmissible from parent to offspring and constitutes predisposition to the disease. In races and families in whom, with occasional intermissions covering perhaps centuries, successive generations have harbored the tubercle bacillus, a certain racial and family immunity has ensued, and they are no longer as prone to the disease as other races and families. Not only is this view in harmony with the laws of biology, but it is corroborated by the history of tuberculosis when looked at from a broad point of view. The people who have longest been exposed to tuberculosis are at present least susceptible to it; and the people who have been exposed most recently are now most susceptible to it and develop it in the most malignant form. For example, the white race which has struggled against tuberculosis for thousands of years, is much more immune than the colored race of Africa and the American Indian, who have been in contact with the disease for but a few centuries. The colored people of America, moreover, are more immune than the colored people of the interior of Africa. While the former have been exposed to the disease for at least two centuries, the latter only recently have been brought in contact with it. Historical outcroppings on the subject of tuberculosis give the impression that the white race was at one time as susceptible to the disease as the colored people and the American Indians are now. Three centuries ago nearly one-half of all Englishmen died of tuberculosis.

Another error about tuberculosis which is ingrained in the popular mind is that tuberculosis is the result of a neglected cold. There is no causative relationship between what is ordinarily termed a cold and consumption, nor between temperature and consumption. A cold, in the popular sense of the word, is an inflammation of the mucous membrane of the respiratory tract, especially the upper air passages, and is always a germ disease. The organism which produces it is as different from the tubercle bacillus, however, as wheat is from rye and is just as incapable of producing tuberculosis as a grain of wheat is incapable of producing a stalk of rye. A cold may stimulate tuberculosis into greater activity and frequently sets up the symptoms which lead to the discovery of the existence of tuberculosis. This no doubt accounts for the association in the popular mind of colds with tuberculosis. Temperature changes can produce neither colds nor tuberculosis. They may influence the progress of both by depressing the resisting power of the individual and thereby predisposing him to the disease. A high temperature will do this as effectually as a low one. There is this retarding influence over the spread of the disease in warm climates, however, which does not exist in cold ones: people live out of doors more and shut themselves up less in ill-ventilated rooms. The prevailing erroneous ideas about the relationship between colds and consumption and between temperature changes and consumption are an impediment to preventive measures and proper treatment.

The replacing of error with truth in the public mind is the all-important step toward the extermination of the disease.

LAWRENCE F. FLICK, M. D.

**Tuberose** (*Polianthus*), a genus of plants of the natural order *Liliaceæ*, having a funnel-shaped perianth, with six-parted limb, stamens inserted in the tube of the corolla, a superior capsule, and flat seeds. The common tuberose, *P. tuberosa*, has rounded bulbous roots; a cylindrical, upright, unbranched stem, three or four feet high; both root leaves and stem leaves sword-shaped, and very acute; flowers spiked and somewhat aggregated, large, pure white, the tube a little incurved. The plant grows well in the S. of Europe, but only bears the open air in Northern climates during summer. The roots are a considerable article of export from Southern to Northern Europe. The plant is in high esteem for the beauty and fragrance of its flowers, the odor of which is most powerful after sunset, and has been known to cause headache and asphyxia in a room. The fading flowers emit, in certain states of the atmosphere, an electric light and sparks. The flowers yield an essential oil, which is used by perfumers. The native country of the tuberose is Mexico. The tuberose has been known in Europe for about three centuries. There are double and single flowered forms in cultivation, the former being the more highly esteemed. They are very extensively grown by British and American florists, who, by planting the roots successionally, manage to keep up a supply of flowers at all seasons. Of the double-flowered form there are several varieties, known in commerce as the double African, the double American, the double Italian, and the pearl, the last named being smaller than the others

DOUBLE TUBEROSE.

**Tube Well,** an iron pipe of small diameter, pointed, and having a number of lateral perforations near the end, driven into the earth by a small pile-driver ham-

mer till a water-bearing stratum is reached. Where the depth exceeds 14 feet, two or more sections of pipe are screwed together. A small pump is attached to the top. The device is said to have been originally used in this country for obtaining brine. By means of it water can be obtained very quickly from small depths; a driven well.

**Tubicolæ,** "tube dwellers," an order of annelids, comprehending those which live in calcareous tubes, composed of secretions from the animal itself, as in serpula; in tubes composed of sand and fragments of shell connected together by a glutinous secretion, as in terebella; or in a tube composed of granules of sand and mud, as in sabella. See SERPULA.

**Tubinares,** petrels; an order of the class Aves, named from the character prevalent throughout the group, of the external nares, which are prolonged into a more or less lengthy cylindrical tube, lying usually on the dorsal surface of the beak, and opening by one or two apertures. They are holorhinal, schizognathous birds, with a large, wide, depressed, pointed vomer, and truncated mandible; anterior toes, fully webbed, and the hallux either very small and reduced to one phalanx or absent; with a tufted oil gland, and large supraorbital glands furrowing the skull. They have an enormous glandular proventriculus, and small gizzard of unusual shape and position. They are divided into two families, *Oceanitidæ and Procellariidæ.*

**Tübingen,** a town of Würtemberg, Germany; 20 miles S. W. of Stuttgart, on a ridge between the Neckar and the Ammer. It is an old place, irregularly built, with steep and narrow streets in the main; but the suburbs, especially round about the new university and the railway station, have wide and spacious streets. Book printing, bookselling, making of chemicals and surgical and physical instruments, milling, dyeing, and trading in field produce, wine, hops, and fruits form the principal sources of employment, besides education. Tübingen has three Protestant churches (one, the Stiftskirche, dating from 1469–1483, and containing the graves of 12 princes of Würtemberg) and one Catholic church. Its university, founded in 1477 by Eberhard im Bart, afterward first Duke of Würtemberg, soon became a distinguished seat of learning, enjoyed for a time the presence of Reuchlin and Melanchthon, and continued to flourish long after the Reformation had firmly established itself. The Thirty Years' War, however, fatally checked its prosperity; and it was not till the early part of the 19th century that it began to reacquire a reputation. Under Baur it became celebrated as headquarters of the historico-philosophical theology known as the "Tübingen School," which has profoundly influenced the study of Church history. Its medical faculty is of late distinguished. The university had (1899) 104 professors and teachers, a library of 200,000 volumes (located in Duke Ulrich's Schloss, on the hill above the town, dating from 1535), and 1,525 students. Connected with it are an anatomical and physical institute, a botanical garden, a chemical laboratory, etc. There is a Protestant seminary and a Catholic one, in which university lectures are given and theological students reside. Uhland long lived here. Pop. (1905) 16,809.

**Tübingen School,** in Church history, the name given to two schools of theology whose chief representatives were connected with the University of Tübingen, either as professors or students.

*The Old School.*— This was essentially orthodox. Its founder was Gottlob Christian Storr (1746–1805), appointed Professor of Philosophy at Tübingen in 1775 and Professor of Theology two years later. He accepted unreservedly the divine authority of the Scriptures, and sought by grammatical and historical exegesis to build up a system of theology, and laid especial emphasis on the evidential value of miracles. He came into conflict with Kant, and criticized his "Religion Within the Limits of Pure Reason" somewhat severely. Storr's theological system is contained in his "Theory of Christian Doctrine Drawn from the Scriptures" (1793). Among his immediate followers were the brothers Johann Freidrich (1759–1821) and Karl Christian Flatt (1772–1843), Friedrich Gottlieb Süsskind (1767–1829), and Ernst Gottlob Bengel (1769–1826), a grandson of the great commentator.

*The Modern School.*— The principles of this school, founded by Ferdinand Christian Baur (1792–1860), also Professor of Theology at Tübingen, were in direct opposition to those of Storr. In 1835 Baur published his book on the pastoral epistles, in which he attempted to prove that they were the work of the 2d century; and in 1845 he denied the authenticity of all the epistles attributed to Paul, except that to the Galatians, I and II Corinthians, and Romans (with the exception of the last two chapters, the genuineness of which he called in question). He considered that Peter and John were Jewish in their views, only distinguished from their brethren by their faith in Christ as the promised Messiah. Paul maintained a doctrine that the crucifixion made Christ the Saviour of the world, and elaborated a theory of justification which to them was strange, and of religious freedom which to them was abhorrent. For the sake of peace they were

for a while silent, but the animosity broke out in the Apocalypse, which referred to St. Paul and his teachings when denouncing the Nicolaitanes. In 1844, in the "Theological Yearbook" (the organ of the school), and in a book on the Gospels, in 1847, Baur attempted to show that the fourth Gospel was not genuine. He maintained that it was written for the purpose of reconciling Judaistic and Pauline Christianity, and consequently belonged to the 2d century. Among the allies and followers of Baur were Zeller, who edited the "Theological Yearbook"; Schwegler, "Post-Apostolic Age," Ritschl "Gospel of Marcion and Gospel of Luke," Kostlin "Doctrinal System of John," Hilgenfeld, and Holsten. As Baur grew older he modified his views greatly, and his "Christianity of the First Three Centuries" (1853), is a more conservative work than his previous writings. He asserts the pure morality of Christianity, while he denies its miracles. Since the death of Baur some of the Tübingen school have admitted the possibility of miracles as a necessary deduction from Theism, and the judgment concerning the fourth Gospel has been modified, and in some respect reversed. The "Life of Jesus" of Strauss (1832), was the outcome of the teachings of the new Tübingen school. The object of the book is to show that the Gospel narrative concerning Jesus is a philosophic myth — the expression of an idea in the form of an imaginary biography. But in the "New Life of Jesus" he says, "I have, mainly in consequence of Baur's hints, allowed more room than before to the hypothesis of conscious and intentional fiction." According to Prof. H. Schmidt, of Breslau, the historical and critical studies of Baur, though they led him to unsound conclusions, prepared the way for the brilliant achievements in the departments of Church history and doctrine of the present generation, and must ever be a starting point for the history of early Christianity.

**Tubipora,** the organ-pipe coral; a genus of *Alcyonidæ,* consituting the sub-family *Tubiporinæ* (sometimes elevated to family of *Alcyonaria,* as *Tubiporidæ*). There are several species from the Red Sea and the Pacific. They increase by the production of a wall of calcareous spicules and a kind of corallum.

**Tubular Bridge,** a bridge formed by a great tube or hollow beam, through the center of which a roadway or railroad passes. The most remarkable bridge of this kind is the Britannia Bridge, for though the bridge since carried across the St. Lawrence is of much greater total length, the width of each of its constituent spans is less. Notwithstanding the success of these structures, the tubular form has been to a great extent superseded by the lattice bridge, a kind of bridge patented in 1835 by the American engineer, Ithiel Torm, and since that time much used for spanning rivers of great breadth. See Bridge.

**Tubulibranchiata,** in zoölogy, an order of hermaphrodite gasteropodus mollusks, comprehending those which have the shell in the form of a more or less irregular tube in which the branchiæ are lodged.

**Tub Wheel,** a form of waterwheel which has a vertical axis and radial spiral floats, which are placed between two conical cases attached to the axis. The water is precipitated from a chute upon the wheel, and follows the spiral canals of the wheel till it is discharged at the bottom. It is a combination of the horizontal and common recoil wheel. The water, having exerted a certain percussive force, flows downward, and passes out as in the downward-discharge turbine.

**Tuckahoe,** or **Tuckahoo,** an Indian name given to a vegetable substance of doubtful affinity, dug up in various parts of the United States. sometimes of the size or shape of a loaf of bread and hence called "Indian loaf." Fries thought it was a fungus, and placed it in the genus *Pachyma.* Berkely considers that it is more probably the altered state of the root of some flowering plant. It consists almost entirely of pectic acid, the chemical substance which, occurring in currants and other fruits, renders it possible to coagulate them into jelly. Tuckahoe is eaten by the North American Indians, who find it a nutritious food. Also, a derisive name applied by Western Virginians to the natives of tide water sections of that State.

**Tucker, Abraham,** an English philosophical writer; born in London, Sept. 2, 1705. In 1721 he was entered as a gentleman commoner at Merton College, Oxford, and about three years later he proceeded to the Inner Temple; but the fortune which he had inherited from his father relieving him from all personal need of a profession, he gave up the thought of practising at the bar, and having in 1727 purchased Beckworth Castle, near Dorking, he settled down as a country squire. His leisure was at first divided between farming and philosophy, but after the death of his wife in 1754 the latter became decidedly the predominant occupation of his thoughts, and in 1763 he published, under the title of "Free Will," a tentative specimen of a great philosophical treatise. To a criticism on this portion he replied in the same year by "Man in Quest of Himself, by Cuthbert Comment," and in 1768 he brought out the first three volumes of the extended work as "The Light of Nature Pursued, by Edward Search, Esq." The remaining vol-

umes, four in number, did not appear till after his death. Though destitute of system and prolix in the treatment of his themes, which range over the whole ground of morals and natural religion, Tucker succeeded, by the charm of a spontaneous and vivacious style and the deeper charm of an earnest and yet cheerful and charitable spirit, combined with no small ingenuity of exposition and even originality of thought, in securing the grateful suffrages at once of the professional philosopher and the man of letters — of a Paley and a Hazlitt, of a Mackintosh and a Leigh Hunt. His "Light of Nature" has been frequently reprinted: Hazlitt brought out an abridgment of it in 1807. He died in Beckworth, Nov 20, 1774.

**Tucker, George,** an American educator; born in Bermuda in 1775; was graduated at William and Mary College in 1797; studied law and practised in Lynchburg. He was a member of Congress in 1819–1825. For 20 years he was Professor of Moral Philosophy in the University of Virginia (1825–1845). He wrote for many journals and periodicals; was the author of "Letters on the Conspiracy of Slaves in Virginia" (1800); "Essays on Subjects of Taste," etc. (1822); "The Valley of the Shenandoah" (1824), a novel; "Principles of Rent, Wages, and Profits" (1837); "Life of Thomas Jefferson" (1837); "History of the United States from their Colonization to 1841" (4 vols. 1856–1858); "Banks or No Banks" (1857); and "Essays, Moral and Philosophical" (1860). He died in Sherwood, Albemarle co., Va., April 10, 1861.

**Tucker, Gideon J.,** an American jurist; born in New York city, Feb. 10, 1826; received a common school education; was admitted to the bar in 1847; appointed clerk in the New York custom house in 1853; was for a short time editor of the Albany "Argus"; and founded the New York "Daily News" in 1855. He was elected Secretary of State in 1857; Regent of the University of the State of New York in 1858; and surrogate of New York city to fill a vacancy in 1862, and for a full term in 1863; and to the Assembly in 1865 and 1866. In 1868–1875 he practised law in New York city; was supervisor of the census in 1874; one of the leaders who bolted from Tammany Hall and assisted in founding Irving Hall; went to Arizona in 1878, where he remained till 1883, during which time he was United States Commissioner of the Supreme Court. He died in New York city, July 10, 1899.

**Tucker, Gilbert Milligan,** an American author; born in Albany, N. Y., Aug. 26, 1847; was graduated at Williams Colllege in 1867 and engaged in journalism. In 1897 he became editor-in-chief of "The Country Gentleman." His publications include: "Our Common Speech" (1895); "Irrigation Schemes at the West" (an address); and review contributions "American English" (1833); "The Argument from Law" (1882); "Orthodoxy and Nature" (1884); "Grammatical Suggestions from a Workshop" (1885); etc.

**Tucker, John Randolph,** an American naval officer; born in Alexandria, Va., Jan. 31, 1812; joined the navy in 1826 and was promoted lieutenant in 1837. During the Mexican War he was executive officer of the bomb brig "Stromboli", and took part in the capture of Tabasco and other operations. He was promoted commander in 1855, and was assigned to the command of the receiving ship "Pennsylvania," stationed at Norfolk. He resigned from the United States navy in April, 1861, and became a commander in the navy of Virginia. In June of the same year he was placed in command of the steamer "Yorktown", which later was named the "Patrick Henry." With this vessel he took part in the various engagements in Hampton Roads, including the conflict between the "Monitor" and "Merrimac" on March 9, 1862. On the 13th following he was given command of the wooden squadron. He participated in the repulse of the National fleet at Drury's Bluff, and was soon after promoted captain and sent to Charleston, S. C., to command the naval forces as flag-officer. In February, 1865, after the surrender of Charleston he organized the naval brigade at Drury's Bluff and commanded it till the Confederate army retreated from Richmond. During that retreat he served in the corps of General Ewell. In 1866 he took command of the Peruvian navy with the rank of rear-admiral. During the war between Peru, Chile, and Spain, he had command of the combined squadrons of the two republics. He afterward settled in Petersburg, Va., where he died June 12, 1883.

**Tucker, William Jewett,** an American educator; born in Griswold, Conn., July 13, 1839; was graduated at Dartmouth College in 1861, and at Andover Theological Seminary in 1866; was ordained in the Congregational Church and held several pastorates; was a professor in Andover Theological Seminary; and was president of Dartmouth College in 1893-1909.

**Tuckerman, Bayard,** an American writer; born in New York city, July 2, 1855; was graduated at Harvard College in 1878. His works include: "A History of English Prose Fiction" (1882); "Diary of Philip Horn"; "Life of Lafayette"; "William Jay and the Abolition of Slavery"; "Life of Peter Stuyvesant."

**Tuckerman, Edward,** an American botanist; born in Boston, Mass., Dec. 7, 1817; was graduated at Union College in 1837 and at the Harvard Law School in 1839; studied for several years in Europe; returning to the United States in 1842 he accompanied Asa Gray to the White Mountains on a botanical expedition; was instructor in history at Amherst College in 1854–1873 and Professor of Botany there in 1858–1886. He was the foremost authority on lichenology in the United States. On this subject he wrote nearly 50 papers, describing the lichens of New England and other parts of the United States. At different times he examined and classified specimens found by United States surveying parties. The genus *Tuckermania,* a beautiful California *Compositæ,* was named in his honor. Tuckerman's ravine, on Mount Washington, was also named after him. His publications include: "Genera Lichenum: An Arrangement of North American Lichens" (1872); "A Catalogue of Plants Growing Without Cultivation Within Thirty Miles of Amherst College" (1882); and "A Synopsis of the North American Lichens" (1882). He died in Amherst, Mass., March 15, 1886.

**Tuckerman, Henry Theodore,** an American author; born in Boston, Mass., April 20, 1813. His works include: "The Italian Sketch Book" (1835); "Isabel; or, Sicily" (1839); "Rambles and Reveries" (1841); "Thoughts on the Poets" (1846); "Artist Life" (1847); "Characteristics of Literature" (1849–1851); "The Optimist" (1850); "Poems" (1851); "Memorial of Horatio Greenough" (1853); "Bibliographical Essays" (1857); "Art in America" (1858); "The Book of the Artists" (1867); "The Collector: Essays" (1868). He edited with William Smith "A Smaller History of English and American Literature" (1870). He died in New York city, Dec. 17, 1871.

**Tucson,** a city and county-seat of Pima co., Ariz.; on the Santa Cruz river, and on the Southern Pacific railroad; 250 miles E. of Yuma. Here are the University of Arizona, the Institute of St. Joseph, a high school, several libraries, court house, hospital, convent, National banks, and daily and weekly newspapers. It is in the heart of a large farming, stock raising and mining section; has a valuable trade in hides, wool, precious metals, etc., and in special supplies for the United States army and for the Indians of that section. The place was first settled by Jesuit missionaries in 1560. Prior to that year it had been an Indian town. In 1867–1877 it was the capital of the Territory of Arizona. The United States Signal Station here is 2,404 feet above sea-level. The assessed property valuation is about $2,200,000. Pop. (1890) 5,150; (1900) 7,531; (1910) 13,193.

**Tucum,** a species of palm, *Astrocaryum vulgare,* of great importance to the Brazilian Indians, who make cordage, bowstrings, fishing nets, etc., from the fine durable fiber consisting of the epidermis of its unexpanded leaves. The name is also given to the fiber or thread, and to an oil obtained from the plant.

**Tucuman,** a city and capital of a province of the same name in the Argentine Republic; on the Rio Sil, 3 miles from the mountains and 723 miles N. W. of Buenos Ayres, contains some handsome public and private buildings, a normal school, and several saw and flour mills and breweries, and manufactures sugar, leather, and brandy. In the neighborhood are orange groves, sugar plantations, and distilleries. Tucuman was founded in 1564; and here in 1812 Belgrano defeated the Spanish forces, and in 1816 a congress of deputies from the various provinces proclaimed the independence of the La Plata States. Pop. (1906) 55,000.

**Tudor,** the name of one of the royal families of England allied to the race of Plantagnets. The line embraced five sovereigns, and commenced in 1485 with Henry Tudor, Earl of Richmond, the grandson of Sir Owen Tudor, a Welsh knight of distinction, by his wife, the widow of Henry V., and who, after the battle of Bosworth Field, was proclaimed king by the title of Henry VII.; from him the crown descended to his son Henry VIII., whose son Edward VI. succeeded, and after him his two sisters, Mary and Elizabeth; the Tudor dynasty expiring with the death of the latter in 1603, when the house of Stuart succeeded.

**Tudor Style,** in architecture, a term applied to the Perpendicular style, from the fact that it attained its greatest development under Henry VII., the first of the Tudor line. The chapel which that monarch erected at Westminster is a famous specimen of this style. The term is applied specifically to late Perpendicular work. There are three phases of, or developments from the Perpendicular:

(1) The Early Tudor, from the reign of Edward IV. to that of Henry VII. inclusive. Of this style there are no perfect buildings, and only few traces remaining. The Palace of Shene, built by Henry VII., has totally disappeared; but, according to the Survey of 1649, it abounded with bay windows of capricious design, with rectangular and semicircular projections, and was adorned with many octagonal towers, surmounted with bulbous cupolas of the same plan, having their angles enriched with crockets.

(2) Tudor, in vogue during the reign of Henry VIII. The plan of the larger mansions of this period was quadrangular, comprising an inner and base court, between which stood the gate house. On the side of the inner court facing the entrance were the great chamber, or room of assembly, the hall, the chapel, the gallery for amusements, on an upper story, running the whole length of the principal side of the quadrangle, and the summer and winter parlors. The materials were either brick or stone, sometimes both combined. Molded brickwork and terra-cotta were also employed for decorative purposes. Among the more striking peculiarities were the gate houses, the numerous turrets and ornamental chimneys, the large and beautiful bay and oriel windows, hammer beam roofs, and paneled wainscoting round the apartments.

(3) Late Tudor, or Elizabethan.

**Tuedian Beds,** in geology, the name given, in 1855, by George Tate, to a series of beds underlying the Carboniferous Limestone of Northumberland and Durham, England. They consist of white, or pale brown and gray sandstones, and greenish-gray shales, cement stones, and impure limestones. Called in Scotland the calciferous sandstones.

**Tuesday,** the third day of the week, so called from the Anglo-Saxon god of war, Tiu, or Tiw. The Scandinavian form of the name is Tyr (*q. v.*).

**Tufa,** a name given to a light, porous, calcareous stone, sometimes having the aspect of a sandstone, at others earthy and inclosing the decomposed remains of vegetable substances; composition, a carbonate of lime; deposited by springs, rivers, and heated waters which have traversed calcareous rocks; sometimes confounded with tuff which is the term specifically applied to a fragmentary deposit of a volcanic nature composed of heterogeneous materials.

**Tufts College,** a coeducational institution in Tufts College Station, Mass.; chartered in 1852 under the auspices of the Universalist Church, but now non-sectarian in control; has productive funds exceeding $2,500,000; grounds and buildings valued at over $1,350,000; scientific apparatus, etc., $50,000; volumes in the library, about 59,000; average faculty, 217; students, 1,125; graduates, over 3,000.

**Tugboat,** a small boat used for towing large vessels in and out of harbors, etc. More than 1,000 of these are employed in New York harbor alone and are classed by boatmen under various names, such as "Hookers," those heavy, seaworthy little vessels which go to Sandy Hook and beyond; "Gaters," which take the course through Hell Gate; and "Sand-Scrapers," which ply on the canals, etc. They are also of great service in forcing a channel through the ice; in rescue work if there is a wreck or a ship on fire; in transporting car floats for the railroad companies and in towing great rafts of logs.

**Tugendbund** ("league of virtue"), a Prussian patriotic union founded at Königsberg in 1808, ostensibly for the promotion of educational, social, and other reforms, but actually cherishing schemes for throwing off the French yoke. Regarded with some suspicion by the Prussian authorities, the association (which had some 400 members, but did not include the national leaders such as Stein or Scharnhorst) was dissolved under pressure from Napoleon in 1809.

**Tug=of=war,** a game in which a number of persons divide into two parties, each under the command of a leader. A line is marked out on the ground, and the two parties, laying hold of either end of a stout rope, try to drag each other across the line.

**Tuille,** or **Tuillette,** in military antiquity, one of the guard plates appended to the tasses, to which they were frequently fastened by straps. They hung down, and covered the upper part of the thigh, and were first introduced in the reign of Henry V.

**Tuileries** (twēl-rēz), the residence of the French monarchs; on the right bank of the Seine, in Paris. Catharine de Medici, wife of Henry II., began the building (1564); Henry IV. extended it, and founded the old gallery (1600); and Louis XIV. enlarged it (1654), and completed that gallery. The side toward the Louvre consisted of five pavilions and four ranges of buildings; the other side had only three pavilions. During the revolution of 1830 the palace was sacked. It was restored by Louis Philippe to its former splendor, but in 1848 it was again pillaged. The Tuileries then became a hospital for wounded soldiers, a picture gallery, and the home of Louis Napoleon in 1851. On May 23, 1871, it was almost totally destroyed by fire (the work of the communists), and the remaining portions were removed in the year 1883.

**Tukotuko,** in zoölogy, the *Ctenomys brasiliensis,* a small nocturnal rodent, about the size of a rat, from South America. It is named in imitation of its cry, which surprises a stranger hearing it for the first time, since the animal is concealed in its long burrow. Its food consists chiefly of the roots of plants, in its search for which it drives long galleries, in some places completely tunneling the ground.

**Tula,** an ancient and important manufacturing town of Central Russia, capital of a province of the same name on the Upa, an affluent of the Oka, 110 miles S. of Moscow. Its churches, its arsenal, museum, and government offices, and the ancient Kreml are the principal buildings. The principal industries are in iron and steel goods, especially the firearms of the great imperial gun factory or private workshops. The Russian army is largely supplied with muskets and small arms from the works of this town. Cutlery, locks, *samovars* or tea urns, mathematical instruments, harmoniums, and bells are also made in great perfection; the niello work of Tula is famous; and dyeing, tallow melting, and the making of soap, candles, sealing wax, leather, silk, platinum ware, and jewelry are carried on. Pop. (1908) 114,733.

**Tula-metal,** an alloy of silver, with small proportions of lead and copper, forming the base of the celebrated Russian snuff boxes popularly called platinum boxes.

**Tulane, Paul,** an American philanthropist; born near Princeton, N. J., in May, 1801, son of a French emigrant. He received a common school education, and in 1818 he went to New Orleans, opened a store for general merchandise, and by 1828 he had amassed a fortune of over $150,000. This business he continued to carry on for nearly 40 years, engaging at the same time in cotton and real estate speculations, and in 1857 he retired with a large fortune. About this time he bought the Stockton place at Princeton, where he subsequently resided. For many years he gave liberally to the charitable institutions of Princeton and New Orleans. In 1822 he gave to the city of New Orleans real estate, which with subsequent gifts aggregated $1,100,000, intending to add about $1,000,000 to the amount, but dying intestate, it fell to his heirs. This gift was used to found TULANE UNIVERSITY (*q. v.*). He died near Princeton, N. J., March 27, 1887.

**Tulane University,** an American educational institution in New Orleans, La., formerly known as the University of Louisiana, but reorganized on its present plan in 1884. Up to the time of his death, Paul Tulane, its founder had given it $1,100,000. It affords advantages for higher education to the white youth of Louisiana. It has a law department, medical department, College of Technology, College of Arts and Sciences, a department of philosophy and sciences, and the H. Newcomb Memorial College for Women, to which Mrs. Josephine Louise Newcomb gave $500,000. It also has as its school for medical students the Charity Hospital, containing 700 beds and accommodating 6,000 patients per annum. The various departments of the university are located in different parts of the city in modern buildings, with the most complete scientific, mechanical, and literary equipment. The university has an endowment exceeding $2,575,000; grounds and buildings valued at over $1,800,000; scientific apparatus, etc., $125,000; volumes in the library, about 55,000; average number of faculty, 190; average student attendance, 2,500; ordinary annual income, about $175,000.

**Tulbaghia** (named after Tulbagh, a Dutch governor at the Cape of Good Hope), in botany, a genus of *Liliaceæ* allied to *Anthericum*, with a rotate perianth and a three-valved capsule, with loculicidal dehiscence, and a smell like garlic. Known species seven, from the Cape of Good Hope. They are boiled in milk and given in phthisical complaints.

**Tulchan Bishop,** in Church history, the name given by the people to any bishop appointed in the Scotch Church under the Concordat of Leith, A. D. 1572, which provided for the restoration of the old hierarchical titles under the control of the General Assembly. The men who consented to take the titles bound themselves, as the price of their elevation, to receive only a small part of the revenues, the larger portion going to Morton and his colleagues.

**Tule,** the name given by the Mexican Spaniards in California to *Scirpus lacustris*, the club rush or bulrush, which grows abundantly in certain places in the country; two lakes in Upper California being called, in consequence, the Tule Lakes. It has been employed as a material for making paper, baskets, chair seats, etc. The root is astringent and diuretic.

**Tulip,** a genus of bulbous *Liliaceæ*, with usually solitary campanulate flowers of six free segments; stamens hypogynous, filaments short, anthers fixed by the base, mobile, linear, bursting inwards; ovary three-cornered; stigma sessile with three radiating lobes; capsule erect, coriaceous. The genus is restricted to the Old World, extending from Western Europe to Japan and the Himalayas; there are about 45 species, of which one is found in Great Britain. The common garden tulip (*T. Gesneriana*) has been cultivated away from its native country of Southern Russia and Armenia for upwards of three centuries. The first description given of it is by Conrad Gesner, in a memoir published in 1561. He had seen it in bloom in April, 1559, at Augsburg, in the garden of Herwart, who had received the seeds from Byzantium — probably from Dr. Busbecq, who knew the plant as grown by the Turks. It spread rapidly and appeared in most of the botanical books of the second half of the 16th century. Into the Nether-

lands it was introduced in 1571, into England in 1577 (by James Garret), and into France by Peiresc, who cultivated it in 1610 at Aix, having received it from Tournay.

The taste for the tulip has since increased and their bulbs have become an article of commerce; it was carried to a ridiculous extent, and the tulip mania reached its height in Holland from 1634 to 1637. (See TULIP MANIA.) To develop all the beauty of form and color of which the tulip is susceptible requires the greatest care in its cultivation. From seed new varieties are raised, the seedlings blossoming at four to seven years. Hundreds of varieties have been established from time to time, which range under four groups — bizarres, byblœmens, roses, and selfs. The first have a yellow ground marked with purple or scarlet; the second a white ground variegated with violet or purple of various shades; the third are marked with rose, scarlet, or crimson on a white ground; and the fourth or plain-colored tulip have a white or yellow ground without any marks. The first three of these families are again divided into feathered and flamed according as the intermingled colors are in narrow or broad stripes. Various other species of *Tulipa* are now represented in all good collections of bulbous plants, and the early-flowering fragrant *T. suaveolens* is often seen in window culture. The yellow-flowered *T. sylvestris*, is common in Europe, and in Siberia its bulbs are eaten. *Tulipa* is derived from the Turkish word *tulipan*, a "turban," the rich and varied flowers resembling an inverted cap.

**Tulip Mania,** an extravagant passion for the possession of tulips or tulip bulbs. Tulips were introduced into Holland late in the 16th century, and the soil and climate being favorable, their cultivation formed an important branch of industry, and the plants became more and more in request as they increased in variety and beauty. The Dutch merchants therefore made the purchase and sale of these bulbs a part of their regular trade, and supplied other European nations with their importations. What was at first a legitimate trade afterward developed into the wildest speculation, which rose to its greatest height between 1634 and 1637. For a single bulb of the species *Semper Augustus*, 13,000 florins, about $5,200 were once paid, and for three, 30,000 florins, about $12,000 and equally extravagant sums for other kinds. Men then dealt in bulbs as they do now in stocks and shares. At length the fictitious trade collapsed. Many persons who had suffered ruinous losses broke their contracts; confidence in the ultimate realization of the money which the bulbs were supposed to represent then vanished, and ruin spread far and wide.

**Tulip Tree,** the *Liriodendron tulipifera*, one of the most magnificent forest trees of temperate North America; attaining in favorable situations a height of 100–140 feet, with a straight, clear trunk. It is the only species of the genus — which belongs to the Magnolia family — and may be recognized by its large three-lobed leaves, with the middle lobe cut square at the end, and large solitary tulip-like flowers having greenish sepals, and petals variegated with yellow and orange. The wood is highly esteemed, uniting lightness with strength and durability. It is of a pale-yellow color, fine-grained, compact, is easily worked, takes a good polish, and is much used by house and bridge constructors, by cabinetmakers, coachbuilders, implement-makers, etc., and by the Indians for canoes. The bark is officinal in the secondary list of the "United States Pharmacopœia" as a stimulant, tonic, and diaphoretic. The noble appearance of the tree led to its introduction more than 200 years ago into Europe, where it is appreciated as a great ornament for pleasure grounds, etc.

FLOWER OF TULIP TREE.

**Tulle,** a kind of thin, open silk network fabric, originally manufactured at Tulle in France.

**Tulle,** a town in the department of Corrèze, France; on the Corrèze; 20 miles N. E. of Brive. It is an ill-built but finely situated town with a much-admired cathedral presenting a mixture of the Gothic and Classical styles. The Maison Sage and a square tower attributed to the Romans are the other buildings of note. Tulle has manufactures of arms, leather, lace (*Point de Tulle*), etc., and carries on a trade in iron and agricultural products. Some say it takes its name from a Roman fort called Tutela; more probably it first sprang up in the 14th century round a monastery. Pop. (1901) 17,412.

**Tullius, Servius,** the sixth legendary king of Rome, the son of a slave in the house of Tarquinius Priscus, and made king on his death by the arts of his queen, Tanaquil.

**Tulloch, John,** a Scotch theologian; born near Bridge of Earn, Perthshire, June 1, 1823, studied at the University of St.

Andrews; and in 1844 was licensed as a preacher in the Church of Scotland. After holding for some years a charge in Dundee, he was in 1849 presented to the parish of Kettins in Forfarshire, and in 1854, on the death of Dr. Haldane, was appointed Principal of St. Mary's College, University of St. Andrews. He first attracted notice as a writer in the "British Quarterly" and "North British Review." In 1855 he obtained the second Burnett prize (£600) on the "Being and Attributes of God," and his essay was published under the title "Theism." After that he was a prolific contributor to the religious and philosophical literature of the day, much of his work being first given to the public through the medium of the lecture room, and afterward collected into separate volumes. Of these the most important are "Leaders of the Reformation" (1859); "English Puritanism and its Leaders" (1861); "Beginning Life, Chapters for Young Men" (1861); "The Christ of the Gospels, and the Christ of Modern Criticism" (1864); "Rational Theology and Christian Philosophy in the Seventeenth Century" (2 vols. 1872); "Religion and Theology, a Sermon for the Times" (1875); "Facts of Religion and of Life" (Sermons) (1876); and "Pascal" in Blackwood's series of "Foreign Classics" (1878). In the spring of 1879 he delivered two very striking lectures at the Edinburgh Philosophical Institution on "The Intellectual and Literary Revival in Scotland in the 18th Century." In 1878 he was chosen Moderator of the Church of Scotland, and discharged the duties of the office with singular dignity and tact. Of late years he was generally recognized as the leader of the "Broad Church" party. He died in Torquay, England, Feb. 13, 1886.

**Tullus Hostilius,** the third mythical king of Rome, and successor of Numa. His reign was a series of wars with Alba, the Veii, and the Sabines. The legend of the famous combat between the Horatii and Curiatii forms part of the story of the Alban war.

**Tulostoma,** in botany, a genus of *Trichogastres;* puff-balls, with the peridium paper-like, distinct from the stem, which is tall. At first covered with a scaly or powdery coat or veil which soon falls away; then an orifice gives egress to the spores. Species few.

TUMULUS WITH BURIAL CHAMBER, SWEDEN

**Tulsa,** a city and county-seat of Tulsa co., Okl.; in what was formerly the Creek Nation, Ind. Terr.; on the Santa Fé and other railroads; 14 miles N. N. E. of Sapulpa. It is the center of the great mid-continent oil field, and in a natural gas, coal, limestone, and hard-wood region; is the seat of Henry Kendall College (Presb.); and is a very young, very rich, and very progressive city, with great possibilities. Pop. (1900) 1,390; (1910) 18,182.

**Tumor,** in surgery, any morbid parasitic growth, generally, though not always, attended by swelling. Tumors are primarily divided into two classes, the first innocent, including non-malignant, solid, be-

nign, or sarcomatous, and the second malignant growths. Tumors of the first type occur in comparatively few tissues, and do not alter the adjacent parts unless the tumor produces pressure and partial inflammation; they have no tendency to ulcerate or slough, and, if extirpated by a surgical operation, they do not grow again. They vary considerably in structure, being fatty, cellular, fibrous, fibroid or tendinous, encysted, vascular, cartilaginous osseous, or fibro-cartilaginous. Fatty and cartilaginous tumors often reach a size so large that they weigh many pounds. They should be excised while they are small. A tumor of the second type, on the contrary, may arise in almost any part of the body, though some parts are more liable than others to attacks. They tend to propagate their morbid action to the adjacent parts, or, by means of the blood, even to spots remote from their formative seat; they ulcerate or slough, and, when extirpated by surgical operation, grow again, either at the original or some other place. The cancer and tubercle are leading types of malignant tumors. A third type of tumor, the semimalignant, is intermediate between the first two, and includes some forms of sarcomic and of melanotic tumor, the painful subcutaneous tumor or tubercle, nævi, polypi, etc. Melanosis is commoner in horses than in the human subject, and chiefly in white or gray horses. Various tumors are interthoracic, affecting the heart, the lungs, etc. There are also tumors of the brain, of the liver, the rectum, etc.; and in women the uterus and the vagina are specially liable to be affected with tumor.

**Tumulus,** a mound raised over a tomb, or, more rarely, as a memorial of some person or event. Tumuli are found in large numbers in all parts of the world. Many date from prehistoric times, and they are mentioned in the earliest writings of the human race. In the Bible three instances of this mode of burial occur (Josh. vii: 26, viii: 29; II Sam. xviii: 17); according to Homer, a tumulus was raised over Patroclus, and Dercennus, King of Latium was said by Vergil to be interred in a similar manner. This method of interment continued down to historical periods, and is still practised among savage races. Not improbably some traces of it linger in civilized communities in the practice of throwing earth on the coffin at a funeral. In size tumuli vary greatly, the larger probably marking the graves of chiefs or persons of distinction. The highest in England is at Silbury Hill, Wiltshire; it is 170 feet high, and there is some doubt as to whether it is really a burial place; it may be a memorial, like the heap of witness erected by Laban and Jacob (Gen. xxxi: 52), or the mound thrown up by the Ten Thousand of Xenophon's "Anabasis," in their celebrated retreat. when they obtained their first view of the sea. At Upsala, in Sweden, there are three large and high tumuli close together, popularly supposed to be the burial places of Odin, Thor, and Freya. Most of the tumuli in Scandinavia, where they are extremely numerous, consist of large mounds, in which there is a passage leading into a central chamber, round the sides of which are placed the bodies of the dead. These tumuli closely resemble the dwelling houses of Arctic people, such as the Esquimaux. In England there is very rarely any chamber, the mound being raised over a simple stone vault or chest. Inside the chambers or vaults are found the bones or ashes of the dead, or, possibly, of the victims of funeral sacrifice, together with stone or bronze implements, pottery, ornaments, and bones of animals, probably the relics of burial feasts. The determination of the age of tumuli is a very difficult problem. As a general rule, where the bodies have been buried in a sitting or contracted position, the tumulus belongs to the Neolithic Age; where the body has been cremated, to the Bronze Age; and where the body is in an extended position, to the Iron Age.

In the United States from the Rocky Mountains eastward to the Alleghenies, and from the S. shore of Lake Erie to the Gulf of Mexico, there are prehistoric tumuli, constructed by an extinct race of people. In the N. part of the district indicated, the mounds are few and small. In the S. part they are more numerous and of greater size and altitude. They are evidently of a common origin. The tumuli of Mexico and Peru are still greater in dimensions. In most that have been examined there have been found the bones of the dead and articles of use and ornamentation. The Anthropological Department of the World's Columbian Exposition, held in Chicago in 1893, contained a very complete exhibit of these relics of an extinct race. See MOUND BUILDERS.

**Tun,** an old measure of capacity. The English tun of wine contained four hogsheads, or 252 gallons, but in Great Britain all higher measures than the gallon are no longer legal.

**Tunbridge,** or **Tonbridge,** a market town of Kent, England; 29½ miles S. E. of London; on the Medway, which here divides into six streams, one of them called the Tun. A castle, originally Norman, but largly rebuilt in 1280–1300, and held successively by Fitz-Gilberts, De Clares, Audleys, and Staffords, retains a fine Early Decorated gatehouse. The parish church, also Decorated in style, was almost rebuilt in 1878; and the grammar school, founded in 1553 by Lord Mayor Sir Andrew Judd, occupies handsome new buildings of 1865. Remodelled in 1880, it has a rich endow-

ment of $27,500 a year, and over 300 boys; Sir Sidney Smith was an alumnus. The manufacture of toys, boxes, and other articles in "Tunbridge ware" (a kind of wood mosiac in veneer) is a specialty. Pop. (1901) 12,736.

**Tunbridge Wells Sand,** in geology, the uppermost beds of the Hastings sand. They are from 160 to 380 feet thick and may be divided into an Upper and Lower Tunbridge Wells sand, the latter associated with Cuckfield clay. They are separated by a clay called the Grinstead clay, which is of fluviomarine origin.

**Tunding,** a word used in Winchester College, England, to describe a punishment there administered by senior pupils termed præfects or præposters, and consisting of a flogging administered between the shoulders with a ground ash. When any grave offense had been committed the punishment was public.

**Tundra,** a term applied to the immense stretches of flat, boggy country, extending through the N. part of Siberia and part of Russia, where vegetation takes an arctic character, consisting in large measure of mosses and lichens. They are frozen the greater part of the year.

**Tungsten,** a rare metal, chiefly derived from wolfram, which is a tungstate of iron and manganese, and likewise found in scheelite, which is a tungstate of lime. The metal (Swedish, *tung-sten,* "heavy stone") is obtained either as a dark-gray powder or in heavy iron-gray bars, which are very hard and difficult of fusion, and have a sp. gr. of 19.1. Aqua regia and nitric acid convert it into tungstic acid. When 10 parts of this metal are alloyed with 90 of steel a mass of extraordinary hardness is obtained. Tungsten forms two compounds with oxygen — viz. a binoxide, $WO_2$, which is obtained in the form of a brown powder by heating tungstic acid to low redness in a current of hydrogen, and which does not form salts with acids; and an acid oxide, known as tungstic anhydride, $WO_3$. Various tungstates have been formed and examined. Of these the most important is the tungstate of soda, which answers admirably as a means of preventing muslin, etc., from bursting out in a flame when brought in contact with fire.

**Tungsten Methyl,** $W(CH_3)_4$; obtained by heating a mixture of tungsten and methylic iodide at 240° in a sealed tube for several days. It crystallizes in colorless tables, melting at 110°.

**Tungstic Acid,** $H_2O \cdot WO_3$; prepared by digesting native calcium tungstate in nitric or hydrochloric acid, and washing out the soluble calcium salt with water. It is of a straw-yellow color, is insoluble in water and acids, but dissolves readily in solutions of the fixed alkalies and in ammonia.

**Tungstic Chloride,** $WCl_6$; hexchloride of tungsten; produced by heating a mixture of tungstic oxide and charcoal in a current of chlorine. It forms dark violet scales, having a bluish metallic iridescence. Its vapor has a reddish-brown color.

**Tungstic Dichloride,** $WCl_2$; obtained by heating tungstic chloride in hydrogen gas. It is a loose, gray powder, destitute of crystalline structure, and readily decomposed by water.

**Tungstic Oxide,** $WO_3$; trioxide of tungsten; a yellow powder obtained by dissolving tungstic acid in ammonia, evaporating to dryness, and heating in contact with air. It is insoluble in most acids, but soluble in alkalies.

**Tungstite,** a mineral occurring mostly as an earthy incrustation, but has been found in distinct cubic crystals at St. Leonard, near Limoges, France. Color, bright yellow or yellow-green. Composition: Oxygen, 20.7; tungsten, 79.3 = 100, with the formula $WO_3$. Called also tungstic acid and tungstic ocher.

**Tungstous Oxide,** $WO_2$; dioxide of tungsten; a brown powder produced by exposing tungstic oxide to hydrogen at a temperature not exceeding dull redness. It is insoluble in water and acids, and, when heated in the air, takes fire, being reconverted into tungstic oxide.

**Tungusic,** a term applied to a group of Turanian tongues spoken by tribes in the N. E. of Asia. The most prominent dialect is the Manchu, spoken by the tribes who conquered China in 1644. These tongues are of a very low grade of development, having no verb, and possessing no distinction of number and person in their predicative words.

**Tunic,** in classical antiquities, a very ancient form of garment in constant use among the Greeks and ultimately adopted by the Romans. The Roman tunic was a sort of shirt worn under the toga, and buckled round the waist by a girdle. It reached an inch or two below the knees, and the sleeves were so short that they merely covered the shoulders; for though tunics hanging down to the ankles (*tunicæ talares*), and with sleeves extending to the wrists and terminating in fringes *tunicatæ manicatæ et fimbriatæ*) were not unknown toward the close of the republic, they were always regarded as indications of effeminate foppery. Senators alone had the right of wearing a tunic with a broad, vertical stripe of purple (*latus clavus*) in front, the garment being hence called *tunica laticlavia,* while the tunic of the equites was distinguished by a narrow stripe, and hence called *tunica angusticlavia.*

**Tunicata,** in zoölogy, sea squirts; a group of animals now usually made a sub-

kingdom, with one class, *Ascidioida*, containing three sub-orders, or families, of which *Ascidia*, *Salpa*, and *Pyrosoma* are the types. They are all marine, and are protected by a leathery elastic integument, or tunic, which takes the place of a shell. None attain a length of more than a few inches, and some are minute and almost microscopic. They have no distinct head, and no separate organs of prehension or locomotion. They possess an alimentary canal suspended within the integument; the mouth opens into a large chamber which usually occupies the greater part of the cavity of the mantle, and which is known as the respiratory sac, or branchial sac, its walls are perforated by numerous apertures. This sac opens into the œsophagus, which is followed by the stomach and intestine coiled upon itself, and terminating in the cloaca, which opens near to the mouth. The heart consists of a simple contractile tube, open at both ends. The nervous system consists of a single ganglion, situated at one side of the mouth. All the tunicata are free during the earlier portion of their existence; at a later period most are fixed; some are simple, while others present various degrees of combination; and, with few exceptions, the sexes are combined in a single individual. They form a connecting link between the Vertebrata and the Invertebrata, from the fact that many of them in the larval state are furnished with a notochord, which atrophies in the adult. Ray Lankester considers them "degenerate vertebrata, standing in the same relation to fishes, frogs and men, as do the barnacles to shrimps, crabs, and lobsters."

**Tunicated Bulb,** in botany, a bulb of which the outer scales are thin and membranous, and cohere, in the form of a distinct covering, as in the hyacinth and onion.

**Tunicin,** $C_6H_{10}O_5$; a substance extracted from the mantle of the Ascidia by successive treatment with water, alcohol, ether, acids, and alkalies. It is a colorless mass, and exhibits most of the characteristics of cellulose.

**Tuning,** the correct adjustment of the sounds of a musical instrument. Such instruments as the flute and horn are tuned without any difficulty, as, if the pitch is altered by accident, it affects every note, and may easily be rectified by varying the length of the pipe. The notes of the organ and pianoforte, however, are unconnected and independent, and require careful adjustment from time to time. Stringed instruments, such as the violin and harp, require tuning on every occasion on which they are used.

**Tuning Fork,** an instrument of steel, consisting of two prongs branching from a short handle, which, when set in vibration, gives a musical note. It was invented by John Shore, in 1811. Though the pitch of forks varies slightly with changes of temperature, or by rust, etc., they are the most accurate means of determining pitch. They are capable of being made of any pitch within certain limits, but those most commonly used are the notes A and C, giving the sounds represented by the second and third spaces in the treble stave. The vibration number of the note C varies from 518 (French diapason-normal) and 528 (Scheibler-medium) to 540 and 544 (Philharmonic).

**Tuning Hammer,** or **Tuning Key,** an instrument consisting of a shank of metal with a cross-handle of wood or metal. The end of it is hollowed so as to fit on the ends of the tuning pins of pianofortes, harps, etc., and by it these instruments are tuned by increasing or decreasing the tension of the strings. Called also a wrench or wrest.

**Tuning Pin,** a movable pin, around the upper end of which the string of a pianoforte, harp, etc., is twisted, the other end of the string passing around a fixed pin. The instrument is tuned by turning the tuning pins with a tuning hammer or wrench.

**Tunis,** a country of North Africa, now a French protectorate; bounded on the N. and N. E. by the Mediterranean, on the S. E. by Tripoli, and on the W. and S. W. by Algeria; area, estimated at 51,000 square miles; pop. about 1,900,000. The coast line presents three indentations, forming the Bay of Tunis on the N., and those of Hammamet and Cabes or the Lesser Syrtis on the E. The N. W. portion of the country is traversed by the Atlas Mountains, which on their lower slopes have many fertile tracts, partly under culture. Between these mountains and the Gulf of Hammamet on the E. stretches the extensive plain or plateau of Kairwan. The only river of any consequence is the Mejerdah. In 1900 there were 883 miles of railway, of which 866 belong to the State.

Agriculture is very much neglected; the principal crops are wheat, barley, and maize; olive plantations are numerous, while tobacco is largely, and cotton, indigo, saffron, and opium partially, grown. On several parts of the coast the fisheries, including that of coral, are valuable. The manufactures consist chiefly of woolen fabrics, soap, dyed skins, and ordinary and morocco leather. The inhabitants consist of a mixture of Moors and Arabs, along with Berbers, here called Kroumirs, occupying the elevated tract N. of the valley of Mejerdah.

In ancient times Tunis belonged to the Carthaginians, afterward formed part of the Roman province of Africa, was subdued

about 675 by the Arabs, became a powerful state under independent rulers in the 13th century, and in 1575 was incorporated with the Ottoman empire. In the spring of 1881 the French invaded Tunis, in order to punish the turbulence of the Kroumirs, and the French minister resident is now the virtual ruler of the country. Under French administration the Tunisian debt has been consolidated, commerce has increased, the means of transit have been improved, and a number of primary schools established. The resident army of occupation numbers 10,000 men. The exports in 1898 were $10,442,930; imports $12,548,936; revenue (1900) $5,035,235; expenditure $5,015,725; debt about $28,510,000.

**Tunis,** a city and capital of the protectorate of the same name; situated at the head of a salt lake, nowhere more than 6 feet deep, which communicates by a narrow channel with the Gulf of Tunis, an inlet 30 miles long. At the outlet of the lake is Goletta, the port of Tunis, whose harbor is a roadstead with good anchorage, and is sheltered from the N. Goletta is connected by railway with Tunis, which is a walled, fortified, and straggling city, whose winding streets are now paved. The whole town has been built of materials taken from the ruins of Carthage, 13 miles N. E. The bazaars of Tunis are good, and some of the mosques are splendid edifices, but Europeans are jealously excluded from them. The Bey's palace is a modern building in the Saracenic style of architecture, internally decorated with great magnificence, but with little taste. The city has 14 schools and colleges, French and Jewish, and in the Great Mosque is also a Mohammedan college. Tunis has important manufactures of woolen, linen, and silk goods (which are exported to all the Mohammedan countries bordering on the Mediterranean), morocco leather, olive oil, soap, and perfumes. A canal opened in 1893 renders Tunis directly accessible to ocean-going vessels. Pop. (1906) 227,519.

**Tunkers,** See DUNKARDS.

**Tunnel,** in engineering, a horizontal or slightly inclined gallery beneath the surface of the ground; generally used for an aqueduct or for the passage of a railway, roadway, or canal. In the construction of railroads it is frequently necessary to pierce the hills, so as to preserve a line of road as nearly level as practicable. The method of proceeding with tunneling depends mainly upon the kind of material to be excavated. This having been generally ascertained by borings and trial shafts, the work is commenced by sinking the working shafts, which must be sufficiently capacious to admit readily of lowering men and materials, raising the material excavated, fixing pumps, and also for starting the heading of the intended tunnel when the required depth is reached. Besides the trial and working shafts, air shafts are sunk for the purpose of effecting ventilation in the works below. Tunnels when not driven through solid rock have usually an arched roof, and are lined with brickwork or masonry. In mining, a level passage driven across the measures or at right angles to the veins which it is its object to reach. Thus distinguished from the drift or gangway which is led along the vein when reached by the tunnel.

The most noted tunnels of the world in 1911 were the Mont Cenis, connecting Italy and France through the Alps, 7½ miles long; St. Gotthard, in Switzerland, connecting Goschenen and Airolo, 9¼ miles; Simplon, connecting France and Switzerland through the Alps, 12¼ miles; Schemnitz, in Hungary (1782-1887), 10.27 miles; Loetschberg, Switzerland, through the Bernese Alps, connecting at Brig with the Simplon, 8.40 miles; Trans-Andean, connecting Argentina and Chile, opened in 1910; Thames, in London (2), between Essex and Gravesend and at Tower Hill; Arlberg, in Austria, 6½ miles; Hoosac, in Massachusetts, 3½ miles; Sutro, in Nevada, 3.06 miles; Great Divide, in Colorado, 2 miles; Gunnison, in Colorado, completed in 1909, 6 miles; Bergen Hill group, in New Jersey; Detroit River, in Michigan, 2.42 miles; Jeddo, in Pennsylvania, through the Milnesville Mountain; and those beneath the Hudson and East rivers and Manhattan, for which see NEW YORK (city).

**Tupelo,** a genus of *Cornaceæ,* consisting of trees inhabiting the swamps and river banks of North America. The common tupelo (*Nyssa aquatica*) attains from 30 to 50 feet, and its wood is much used for naves of wheels, etc. *N. multiflora,* the forest tupelo or black gum tree, has a growth like the beech. Its wood serves for wheels, pumps, bowls, mortars, wooden shoes, and various turners' work.

**Tupper, Sir Charles,** a Canadian statesman; born in Amherst, Nova Scotia, July 2, 1821; studied medicine in Edinburgh University and practised his profession in his native town. He was president of the Canadian Medical Association, 1857–1870. In 1855 he was made a member of the provincial legislature and was prime minister of Nova Scotia in 1864–1867. He warmly advocated the formation of the Dominion of Canada, which took place in 1867, and became a member of Sir John A. Macdonald's cabinet in 1870; became minister of public works in 1878; and in 1879–1884 was minister of railways and canals. While filling the latter office he promoted the construction of the great Canadian Pacific railway. In 1884 he was appointed High Commissioner for Canada in London. He was one of the negotiators of the fisheries

treaty with the United States in 1887–1888, and was created a baronet in the latter year for his services in that matter. In 1895 he represented Canada at the International Railway Conference in London.

**Tupper, Martin Farquhar,** an English poet; born in Marylebone, England, July 17, 1810; was educated at the Charterhouse and under private tutors, and at 19 went to Christ Church, Oxford. A stammer hindered him from taking orders, so, after graduating in 1831, he entered Lincoln's Inn., and in 1835 was called to the bar. But a single will and marriage settlement was his first and last exploit in the way of law. Of his various works, 40 in number, one "Proverbial Philosophy" (1838–1867), brought him and his publisher, Hatchards, a profit of "something like $50,000 apiece." A friend "whose ambition it was to be Tupper's Boswell" predeceased him; but from his own huge "archives" he compiled "My Life as an Author" (1886)—a curious self-study of a poet. He died in Albury, his Surrey home, Nov. 29, 1889.

**Tupy, Eugen,** pseudonym VOLESLAV JABLONSKY, a Czech poet; born in Kardasch-Rzetschitz, Jan. 14, 1813. He was one of the foremost of Bohemian lyrists, and his "Love Songs" in particular are held in great popular favor. He also wrote the didactic poem "The Father's Wisdom." He died in Cracow, March, 1881.

**Tura,** or **Toora,** a river of West Siberia which joins the Tobol, 78 miles W. of Tobolsk. It is about 300 miles long.

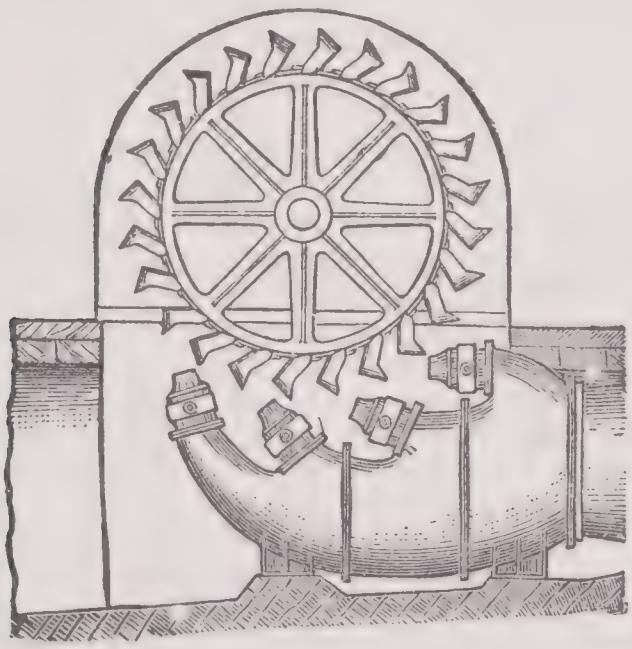
**Turanian,** the title conferred on a vast family of combinatory or agglutinative languages, which is made to comprise every tongue of Asia and Europe that is not either Aryan or Semitic, with the exception of Chinese and its cognate dialects. This family falls, according to Max Müller, into two great divisions, the northern and the southern; the northern being subdivided into five classes, Tungusic, Mongolic, Turkic, Finnic, and Samoyedic; the southern into four, Tamulic or the Dravidian languages of the Dekkan, Bhotîya or the dialects of Bhotan and Tibet, Taïc of Siam, and Malaic of the Malay and Polynesian islands. Under these nine classes he groups 116 dialects, and even then he does not stretch the term Turanian to its widest limits, which with many philologists include Accadian, the language of the Chaldæan inventors of cuneiform, and Basque, and by some are extended to North America. Naturally there is a dispute as to the correctness of the term at all; and while Max Müller asserts that the Turanian languages "share elements in common which they must have borrowed from the same source, and after formal elements are such that it would be impossible to ascribe them to mere accident," Peile in "Philology" (1877) maintains that the title Turanian "had better be avoided, as the agglutinative languages are much too different to give any ground at all for believing that they all belong to the same family. They agree only in the general principle of forming their speech; but no common bond has yet been found to bring together the main groups of the so-called Turanian peoples; and it is not likely there is any." This principle, the combinatory, might certainly have been independently arrived at by different nations, and it is equally rash to regard Japanese as necessarily cognate to Finnish because both are agglutinative languages, as it would be to connect the Semitic and Aryan tongues on the score of their common possession of inflection.

**Turban,** a wrapper worn round the head by Orientals. Turbans are an extremely ancient form of head-covering, and consist of long pieces — sometimes several yards — of fine linen, muslin, silk, taffeta, or fine woolen material, which is twisted and coiled round the head in a cushion-like form. They are worn by all classes, both indoors and out of doors. In Turkey, turbans vary in size and material according to the occupation, rank, or country of the wearer. Learned men affect a full white turban; the descendants of Mohammed always wear a dark-green turban, and the Christians of Lebanon wear a gracefully folded white turban. Some of the Eastern peoples adopt striped, colored silks, with fringes, placing several fezzes, one over the other, making a cumbersome, conical mound, and round these they wrap silken scarves. In Turkey the red fez, with a tassel of dark blue silk, has been extensively adopted, especialy among the upper classes and on the seacoasts. In India, the use of the turban is being rapidly discontinued by the higher classes, who have adopted in its place a brimless cap, which is frequently enriched by embroidery of gold, silver, or silken threads on colored velvet.

**Turbellaria,** in zoölogy, an order of *Platelminthes*; flat worms of low organization, ribbon-shaped, leaf-shaped, oval, broad, or long, inhabiting fresh or salt water, or damp localities on land. The smallest are not larger than some of the Infusoria, which they approach in appearance, while the largest are many feet long. Only one genus, *Alaurina* is divided into distinct segments, and the outer surface of the body is everywhere beset with vibratile cilia. The aperture of the mouth is sometimes situated at the anterior end of the body, sometimes in the middle, or toward the posterior end of its ventral face. In many the oral aperture is surrounded by a flexible muscular lip, which sometimes takes the form of a protrusile proboscis. All

have water vessels, opening externally by ciliated pores, and pseudhæmal vessels; most possess eyes, and some have auditory sacs. Some are monœcious, and others diœcious; in most the embryo passes by insensible gradations into the form of the adult, but some undergo a remarkable metamorphosis. The Turbellaria are variously divided by different authors. Huxley divides them into *Aprocta* (having no anal aperture) and *Proctucha* (having an anal aperture). The first group contains the *Rhabdocœla* and *Dendrocœla* of other authors; the second is equivalent to the *Rhynchocœla* or *Nemertea*.

**Turbine**, in mechanics, a term formerly confined to horizontal water wheels, the revolution of which is due to the pressure derived from falling water, but now applied generally to any wheel driven by water escaping through small orifices subject to such pressure. The turbine was invented by Fourneyron in 1823, and the first one was made in 1827. In the original form the water enters at the center, and, diverging from it in every direction, then enters all the buckets simultaneously, and passes off at the external circumference of the wheel.



TURBINE: PELTON WHEEL.

The pressure with which the water acts on the buckets of the revolving wheel is in proportion to the vertical column of water, or height of the fall, and it is conducted into these buckets by fixed curved girders secured upon a platform within the circle of the revolving part of the machine. The efflux of the water is regulated by a hollow cylindrical sluice, to which stops are fixed, which act together between the guides, and are raised or lowered by screws that communicate with a governor, so that the opening of sluice and stops may be enlarged or reduced in proportion as the velocity of the wheel requires to be accelerated or retarded. The varieties of the turbine are very numerous. In the central discharge turbine the buckets expose their concavities outward to receive the impact of the water from the surrounding chutes. In the Jonval turbine the water is received above and the discharge is downward, that is, parallel to the axis of rotation. In the other forms the water is introduced at the outside and takes a curved course, discharging downward; or, being introduced from the center, is curved downward; or a turbine above delivers the water into a turbine below, rotating in a different direction; or several turbines on one shaft receive water from a series of chutes, so that one or more wheels may be used, as expedient. The axis may be horizontal, or, the axis being vertical, the water may be received from below. Turbines are divided into high and low pressure, the former being relatively small, revolving at a high rate, driven by elevated heads of water. The low pressure turbines are relatively larger, contain a larger volume, and run at a slower rate. In the Black Forest, Germany, turbines are running with heads of 72 and 354 feet, and having diameters of 20 and 13 inches respectively. Low pressure turbines are doing good duty with large volumes of water having only nine inches head. Air and steam turbines are also in use, air and steam being used instead of water to drive the impulse wheel. The most powerful turbines in the world are those installed in 1894-1895 for utilizing the power of Niagara Falls. See STEAM TURBINE.

**Turbinella**, in zoölogy, a genus of *Muricidæ*, which has 70 recent species, widely distributed in tropical and subtropical regions. Shell thick, spire short; columella with several transverse folds; operculum claw-shaped. Fossil species, 70.

**Turbinidæ**, a family of gasteropodous *Mollusca*, represented by the "top shells," and having a pyramidal or top-shaped shell, with a horny or limy operculum.

**Turbine Engine**, an engine driven by means of a steam turbine or turbines. Compound turbine engines have been constructed up to 900 horse power, both condensing and non-condensing, and consumptions of steam as low as 14 pounds per indicated horse power with saturated steam and 100 pounds boiler pressure have been attained in engines of 250 horse power, and still lower consumptions in engines of larger size.

**Turbot**, in ichthyology, *Rhombus maximus*, the most highly valuable of the *Pleuronectidæ*, or flat fishes, for the table. The turbot is a broad fish, scaleless, with numerous flattened, conical tubercles on the upper side; the lower eye is a little in front of the upper eye, and the lateral line makes a semicircular curve above the pectoral fin. In color it varies from gray to brown, often

with spots of a darker hue. Turbot are migratory fish, traveling in companies where the bottom is sandy. They feed chiefly on small fish, crabs, and shell fish; but the bait used is always some fish of bright color and tenacious of life, for, though turbot are very voracious, they will never touch a bait that is not perfectly fresh. Weight from 5 to 50 pounds. In the English Channel turbot are taken by trawling. The turbot was known and prized by the Romans, and the fourth satire of Juvenal celebrates the fact that Domitian convoked the Senate to decide how a monster turbot that had been brought to him should be cooked.

**Turbulent School,** in literature, a name sometimes given to certain German novelists who wrote between 1780 and 1800 in the style of Mrs. Radcliffe, laying their scenes chiefly in the feudal ages. The best known are Cramer, Spiers, Schlenkert, and Veit Weber.

**Turchin, John Basil** (Ivan Vasilevitch Turchininoff), a Russo-American military officer; born in the province of Don, Russia, Jan. 30, 1822; was graduated at the Artillery School, St. Petersburg, in 1841; appointed ensign in the artillery service; took part in the Hungarian campaign; and was graduated at the military academy for officers of the general staff and appointed on the staff of the Imperial Guards in 1852. He was a colonel in the Crimean War. In 1856 he removed to the United States, and was engaged in civil engineering till the Civil War broke out, when he was commissioned colonel of the 19th Illinois Volunteers. He was promoted Brigadier-General of volunteers in 1862; served in the Army of the Cumberland till 1864; and then resigned his commission. He was solicitor of patents in Chicago after the war; resumed his profession of civil engineer in 1870; and established the Polish Colony of Randone, Washington co., Ill., in 1873, where he afterward lived. He was author of articles in various scientific and military periodicals, and of "Military Rambles" and "The Campaign and Battle of Chickamauga." He died in Anna, Ill., June 19, 1901.

**Turdidæ,** thrushes; a family of *Passeres* or of *Turdiformes,* almost universally distributed. Bill rather strong, sides somewhat compressed; wings long; tail moderate. The family is of uncertain extent, varying greatly in different classifications. Wallace makes it consist of 21 genera, containing 205 species, while other authorities divide it into two sub-families (*Turdinæ* and *Sylviinæ*), which are by many considered to be entitled to rank as families.

**Turdiformes,** thrush-like birds; a sub-order of *Acromyodi,* or singing birds, chiefly from the Eastern Hemisphere. Their distinguishing characteristic is the presence of 10 primary feathers in the wing, the first of which is markedly reduced in size. The sub-order is divided into two groups, Coliomorphæ (crow-like passeres) and Cichlomorphæ (thrush-like passeres).

**Turdinæ,** a sub-family of *Turdidæ,* containing turdus and closely allied genera. The plumage is completely molted in the first autumn before migration, so that the young in their first winter plumage differ very slightly from adults. Bill as long as the head; nostrils open, in small groove; wings with first quills very short; tail long and broad; tarsi long, outer toe longer than inner, united to middle at base, hind toe long and strong.

**Turdus,** the type genus of *Turdidæ,* with two species, universally distributed. They abound in the Palæarctic, Oriental, and Neotropical regions, are less plentiful in the Nearctic and Ethiopian, and very scarce in the Australian region. Bill moderate, straight, convex above; point of upper mandible compressed, notched and slightly decurved; gape with a few hairs; nostrils basal, lateral, oval, partly closed by a membrane; wings with the first feather very short, second shorter than the third or fourth, which are usually the longest; tarsus longer than middle toe, outer toe connected with middle toe at base. Besides the species popularly known as thrushes, *T. merula,* the blackbird, *T. torquatus,* the ring ouzel, *T. iliacus,* the redwing, and *T. pilaris,* the fieldfare, are the most familiar.

**Turenne, Henri de la Tour d'Auvergne, Vicomte de,** a French military officer; second son of Henri, Duc de Bouillon, and of Elizabeth, daughter of William I., Prince of Orange; born in Sedan, Sept. 11, 1611. He was brought up in the Reformed faith. At the age of 13 he went to learn the profession of arms under his uncles, the Princes Maurice and Henry of Nassau. Recalled (1630) to France by Richelieu, he was made colonel of a regiment, and first distinguished himself at the siege of La Motte in Lorraine. During the retreat of the French army from Mainz (1635), his courage, fortitude, and humanity were conspicuous. In the campaigns of 1637–1638 he captured Landrecies, Soire-le-Château, Maubeuge, Brisach, etc. During 1639–1642 he served in Italy, chiefly under the Comte d'Harcourt, winning numerous small victories, and capturing Turin, Moncalvo, Ceva, Mondovi, and Coni. His military reputation was now established, and he received the title of Marshal of France.

Toward the close of 1643 he was sent to the Rhine, and entrusted with the com-

mand of the French troops. His achievements during the last five campaigns of the Thirty Years' War covered him with glory, and proved him to be a leader indomitable in spirit and inexhaustible in resource. He captured Philipsbourg and Mainz (September, 1644); held in check his three opponents, Mercy, Gleen, and the Duke of Lorraine; saved Speyer and Baccarat; retook Kreuznach; overran during the winter Suabia and Franconia to the gates of Nuremberg and Wurzburg; won the battle of Nordlingen (Aug. 3, 1645) in spite of the obstinate rashness of the Duc d'Enghien; drove the Spaniards out of the electorate of Treves; by a rapid and skillful march

VICOMTE DE TURENNE.

through Westphalia and Hessen united himself with the Swedes; swept over Suabia and Franconia; invaded Bavaria; was on the point of totally overwhelming the Imperialists, when orders came to withdraw to the Rhine, and, finally (May 17, 1648), utterly defeated Montecuculi and Melander at Sommerhausen on the road to Augsburg. This victory, followed by that of Condé over the Spaniards at Lens, brought about the peace of Westphalia (Oct. 24, 1648), and closed the Thirty Years' War.

Then followed the troubles of the Fronde, in which he at first took the side of the Frondeurs, and through the seductive influence of Mme. de Longueville was induced to enter into culpable negotiations with the Spaniards for an invasion of France. But after a defeat at Rethel (Dec. 15, 1650) he became ashamed of civil war, and returned to his allegiance to the crown. Condé, meanwhile, had quarrelled with Mazarin, and became a Frondeur. The two greatest generals of the age were now opposed to each other; and the firmness, coolness, and scientific skill of Turenne proved more than sufficient to baffle and defeat the impetuous valor of his adversary. In 1652 the victories of Targeau (March 30), of Etampes (March 4), of the Faubourg St. Antoine (July 2), together with his later splendid strategy, placed the young king in possession of Paris (Oct. 21). In 1653 he was in command on the N. frontier, and frustrated all the attempts of Condé and the Spaniards to penetrate through Picardy; in 1654 he stormed the Spanish camp near Arras, and inflicted enormous loss on the enemy; and in 1658 forced Dunkirk to surrender, after destroying the Spanish army of relief. The fall of Dunkirk was followed by the capture of Bergues, Furnes, Dixmude, Oudenarde, Ypres, Comines, De Gramont, Ninove, etc. The treaty of the Pyrenees Nov. 7, 1659, was the result of the brilliant successes of Turenne. When war broke out between France and Holland in 1667, fortune still attended him. In less than four months he captured Charleroi, Ath, Tournai, Douai, Oudenarde, Lille, and Alost. In 1668 he formally adjured Protestantism after considerable reading and reflection — an act which still further advanced him in the favor of Louis. The war between France and Holland (1672–1678) witnessed his last and greatest achievements. His defense of the Rhine with an inferior force, and his invasion of North Germany, were prodigies of military skill and daring; but his devastation of the Palatinate (1674), though done under express orders, has left a dark stain on his reputation. On July 27, 1675, he was killed by a cannon ball at the battle of Salzbach. He was buried at St. Denis amid a national mourning. As a general Turenne has rarely been surpassed. Napoleon admired him without limit. His character as a man is still more admirable. He was modest, simple, truthful, and full of genuine kindliness to all beneath him, especially to his war-worn veterans, to whom he liberally gave of his private resources.

**Turfan,** an important city in Eastern Turkestan (part of which is sometimes named after it), on the S. slope of the Tian-Shan Mountains and on a tributary of the Tarim river. Its once important trade fell off seriously in 1860–1870 owing to the troubles in Kashgar. Pop. 30,000.

**Turgenev, Ivan,** a Russian novelist; born in Orel, Nov. 9, 1818, and was educated at home and in Berlin. His writings show a wonderful insight into human motives and feelings. They include: "Poems" (1841); "Parascha" (1843); "Improvidence" (1843); "Andrei Kolosov" (1844); "Andrei" (1845), a volume of poems; "The Conversation" (1845); "The Landlord"

(1846); "Three Portraits" (1846); "Khor and Kalinych" (1847); "The Bully" (1847); "Dimitri Rudin" (1852); "Two Friends" (1853); "Quiet Life" (1854); "Rudin" (1856); "Faust" (1856); "Asja" (1858); "A Nest of Noblemen" (1859), also translated as "Lisa"; "First Love" (1860); "Hamlet and Don Quixote" (1860); "On the Eve" (1862); "Fathers and Sons" (1862); "Visions" (1863); "The Dog" (1863?); "Story of Lieutenant Jergunov" (1864); "The Brigadier" (1866); "Smoke" (1867); "An Unfortunate" (1868); "A Strange Tale" (1869); "A King Lear of the Steppe" (1870); "Knock! Knock! Knock!" (1870); "Pegasus" (1871); "Chertopchanov's End" (1872); "Punin and Baburin" (1874); "The Living Skeleton" (1875); "The Watch" (1875); "Some One Knocks" (1875); "The Dream" (1876); "New" (1877), also translated as "Virgin Soil"; "Father Alexei's Story" (1877); "Song of Triumphant Love" (1881); "The Old Portraits" (1882); "The Despairing One" (1882); "Poems in Prose" (1882); "Klara Milich" (1883); "The Conflagration at Sea" (1883). He died in Bougival, near Paris, Sept. 3, 1883.

**Turgite** (after the Turginsk copper mine, near Bogoslovsk, Urals, where first observed), a common iron ore frequently mistaken for limonite, to which it bears a strong resemblance; occurs in fibrous masses, sometimes botryoidal and stalactitic, also earthy; hardness, 5–6; sp. gr. varying according to texture, but ranging between 3.56 and 4.681; luster, submetallic and satiny when seen at right angles to the fibers, also dull in the earthy varieties; color, reddish-black to dark-red; streak, red; opaque. Composition: Sesquioxide of iron, 94.7, water, 5.3 = 100, which yields the formula $2Fe_2O_3, H_2O$. Found frequently associated with limonite, but is easily to be distinguished by the color of its streak.

**Turgot, Anne Robert Jacques,** a French statesman; born in Paris, France, May 10, 1727. He was educated for the Church, but renouncing this purpose he studied law, and in 1671 was appointed intendant at Limoges, which post he occupied for 12 years. Shortly after the accession of Louis XVI. in 1774 Turgot was appointed comptroller-general of France, and in order to reform the political and financial condition of the country, he moderated the duties on articles of the first necessity, freed commerce from many fetters, and encouraged industry by enlarging the rights of individuals, and abolishing the exclusive privileges of companies and corporations. Such, however, was the opposition of the clergy and nobility to his reforms that he was dismissed from office in 1776, and retired into private life. He died in Paris, March 20, 1781.

CATHEDRAL OF TURIN.

**Turin,** a city of North Italy; capital of a province of the same name; at the confluence of the Dora Riparia with the Po, and between those two rivers. The city is essentially modern, the streets being broad and regular, and many of them are lined with arcades, while there are numerous wide squares and gardens. The chief building are the cathedral, a renaissance building, completed in the beginning of the 16th century, and remarkable for its marble facade; the royal palace, a plain brick building, which contains the king's private

ROBERT JACQUES TURGOT.

library, with valuable MSS., and the royal armory; the university, a fine edifice recently constructed, in which there is a large library; the Palazzo dell' Accademia delle Scienze, with a picture gallery and museums of natural history and antiquities; the Palazzo Carignano, used at one time by the Sardinian and Italian Parliaments when they met here (1848–1865), and now given up to a collection of natural history; the Madama Palace, an old and interesting building, and several theaters. The environs of the city are beautiful, and offer many objects of interest. Among the educational establishments, in addition to the university, which is attended by over 2,000 students, are an episcopal seminary, a royal military academy, a polytechnic school, and various other colleges and schools. The manufactures consist, besides the staple of silk, chiefly of woolens, cottons, linen, paper, ironmongery, earthenware, and porcelain. Turin was anciently the capital of a tribe called the Taurini, and under the Roman empire was called Augusta Taurinorum. It was long the capital of Savoy, then of the Sardinian kingdom, and from 1861 to 1865 of United Italy. Pop. (1908) 371,000.

**Turin Nut,** in geology, a familiar name for a fossil fruit, resembling a walnut in appearance, found in the Newer Tertiary deposits near Turin. The ligneous envelope has perished, but the form of the surface and that of the enclosed kernel are preserved in the calc spar in which it occurs.

**Turkestan** ("land of the Turks"), the name of a wide, longitudinal, depressed region in Central Asia, which comprises the basins of the Amu-Darya and the Tarim; separated on the S. by the Kuen-Lun from Tibet, by the Karakorum (Mustagh) and Hindu Kush from India and Ladak, the latter chain continuing W. in the mountains of Afghanistan and Persia. In the N. it is separated from Zungaria and the Russian province of Semipolatinsk by the Thian-Shan Mountains. Divided by the Pamir Plateau, or "roofs of the world," into two distinct portions, it has a total estimated area of 961,110 square miles. Eastern Turkestan shades off into the Desert of Gobi, while Western Turkestan, sinking to the level of the Kirghis Steppes, extends to the shores of the Caspian. These two regions have a very dissimilar character, the latter containing the Iranian khanates, now mainly embraced in the Russian empire, the former from olden times, as now, the arena of Turkish adventurers; who have more or less successfully asserted their dominion against the Chinese empire.

Within Western Turkestan are comprised the Russian government-general of Turkestan, the tributary khanates of Bokhara and Khiva, the Turcoman steppes, and the independent hill districts of Karategin on the Upper Oxus. The country is nearly synonmous with the basin of the Amu-Darya, and Russia holds both the right bank of the river in what used to be Khivan territory. and its delta, green with rice fields. Not only is Khiva bound to receive traders from no other country than Russia, but ever since that power occupied Samarcand it has commanded the waters of the Zar-afshan, on which part of Bokhara (and especially its capital) depends for existence. The Amu valley and delta are covered with a grey clay, impermeable to water, and therefore invaluable to the inhabitants for the construction of canal banks. The non-irrigated and far greater part of Western Turkestan, with the exception of a few table-lands, is covered with black or yellow sands, and the only land fit for cultivation, in addition to the oases along the river, are the slopes of the hills. Khiva is the principal of the oases, and the Amu-Darya, at its greatest height in July, overflows the desert in the direction of the Caspian for 50 miles. By November, 1874, the Russians had finished works at Khojend which were capable of irrigating 43,200 hectares.

The climate is one of extremes, and the heat of autumn is aggravated by a wind laden with fine dust which is almost suffocating, and darkens the air for a week at a time. There is as yet little mining, though

Turkey

the Russian flotilla on the Aral draws supplies from the rich coal deposits on the Syr-Darya, while the Thian-Shan and its spurs are particularly rich in iron, lead, rock salt, and naphtha. Gold is found in the Obi district, and in the Karatan Mountains are extensive coal deposits, besides valuable ores. Wheat and clover are the winter crops; all other cereals, such as maize, millet, barley, rice, and peas, are sown in April and gathered in August. Grapes are cheaper than potatoes and yield a good wine. Bokhara cotton is of excellent quality. Tobacco and silk are also largely produced; some tobacco seed from Maryland is succeeding admirably. The chief races are Usbegs, who are purely Turkish; Tajiks, the Iranian and trading people; the predatory Turcomans, Turks with an Iranian infusion; and the nomad Kirghis and Kara-Kalpacks. The Russian government of Turkestan was formed in 1867; is divided into the provinces of Syr-Darya, Ferghana, Semiryechensk, and Samarkand; and has an area of 400,770 square miles, and pop. (1908) 5,961,600. The prevalent language is akin to Turkish.

Eastern Turkestan is called Nan-ly by the Chinese, Altai-shar ("six towns") by adjoining Mohammedans, and Iiti-shar ("seven towns") by its Moslem rulers; area, 550,340 square miles; pop. est. (1904), 1,200,000. Till 1853, Eastern Turkestan was a Chinese province, but that year witnessed a massacre by the natives of the Chinese who rejected Islam, and subsequently it was ruled by its despot liberator, Yakoob Beg, till his death in 1877. He was succeeded by his son, but the Chinese government recovered its lost territory in 1879.

**Turkey,** A Mohammedan State of Southeastern Europe and Western Asia; under the rule of a sultan. In Europe it occupies a considerable portion of the Balkan peninsula, and in this portion is situated the capital, Constantinople, but the larger part of Turkey is in Asia. The immediate possessions of Turkey in Europe, or those directly under the Sultan's rule, extend from Montenegro, Bosnia, Servia, and Eastern Rumelia on the N. to the Ægean and Greece on the S., and from the Black Sea to the Adriatic, the Straits of Otranto, and the Ionic Sea. The treaty of Berlin in 1878 greatly reduced the area under direct Turkish rule, besides confirming the independence and extending the limits of several of the formerly tributary states. The former autonomous province of Eastern Rumelia was absorbed by Bulgaria in 1885; Austria-Hungary annexed Bosnia, Herzegovina, and Novi Bazar in 1908; and the former tributary principality of Bulgaria was declared an independent kingdom, also in 1908. Turkey still holds Crete and some islands in the Ægean. Egypt also is nominally part of the Turkish dominions. Total area in Europe, Asia, and Africa, 1,157,860 square miles; pop. 24,813,700.

*European Turkey.*— European Turkey is traversed in different directions by numerous mountain chains, but the main systems are the Balkan range, stretching from W. to E. between Bulgaria and Eastern Rumelia to Cape Emineh on the Black Sea; Rhodope, S. of the Balkans; the Shardagh and Grammos on the W., continued N. W. under various names into Bosnia and Herzegovina. The most important river basin is that which drains into the Archipelago or Ægean Sea, which receives the Vardar, the Struma, the Mista or Karasu, and the Maritza. There are several plains remarkable for their fertility and beauty. The climate is not so mild as its latitude might seem to indicate, the winter being severe; but the summer heat is excessive. For the production of the ordinary cereals no part of the world is more admirably adapted. The principal grains are maize, wheat, and barley, while rice, millet, and buckwheat, are produced, as also flax, hemp, sesame, and madder. The cultivation of tobacco and cotton is very general. Among fruits the figs are highly esteemed; the cultivation of the olive is carried on along the coasts of the Archipelago and the Adriatic; wine is an important product in many districts; and much attention is paid in some parts to the growing of roses (for otto or attar). There are few manufactures except in Constantinople, Adrianople, and Salonica, and these are of little importance.

*Turkey in Asia.*— This territory comprises the peninsula of Asia Minor, the country intersected by the Euphrates and the Tigris, the mountainous region of Armenia between their upper courses and the Black Sea, the ancient lands of Syria and Palestine, and the coast strips of Arabia along the Red Sea and Persian Gulf. Omitting Arabia, the country consists mainly of: (1) a high plateau traversed by the mountains of Taurus and Anti-Taurus, and stretching from the Archipelago to the borders of Persia. (2) A plateau of less elevation and extent (Syria and Palestine) traversed by the double range of Lebanon. (3) The extensive plain of Mesopotamia on the Lower Tigris and Euphrates. The islands Chios, Lesbos, Rhodes, etc., belong to Turkey in Asia, while the island of Samos is a tributary principality, and Cyprus is held by Great Britain. The chief towns in Asiatic Turkey are Smyrna, Damascus, Bagdad, Aleppo, and Beyrout.

*Commerce, Finance, etc.*— The chief exports are raisins, figs, and dates, silk, cotton, wool, and mohair, opium, coffee, wheat, wine, valonia, olive oil, and tobacco; while the imports are cotton, woolen, and silk goods, metals, iron, steel, glass wares, etc. In 1898 the total exports amounted to $57,375,000; imports to $138,340,000. In

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1900 the revenue was $84,142,325; the expenditure $83,770,095; and the public debt about $625,000,000. The principal railways are those from Constantinople to Adrianople, and from Salonica to Uskup; total length of lines open for traffic in 1900 was 3,000. The length of telegraph lines is about 21,800 miles. Accounts are usually kept in *grush* or piastres, the value of which is something less than 4½ cents; 100 piastres make a Turkish *lira* or gold *medjidié* (value about 36 cents), and 500 make a "purse." The unit of weight is the *oke*, equal to about 2 5-6 pounds avoirdupois. The usual linear measure is the *arshin*, equal to 30 inches.

*People.*— The inhabitants of the Ottoman empire are of very diverse races. First in order are the Osmanli Turks, who, as the dominant race, are diffused over the country. The Greeks form the bulk of the population over great part of the Ægean coasts and islands, and constitute to a very considerable extent the mercantile and trading community of Turkey. Arnauts, or Albanians, are found in the W. throughout Albania; the N. W. is occupied by Servians; and Bulgarians inhabit the district S. of the Danube and E. of Servia and Albania. In Asiatic Turkey the Turks are an important element, but there are also numbers of Armenians, Arabs, Kurds, Jews, Greeks, Circassians, etc. The Turkish language belongs to the Turanian family, and is allied to the Hungarian and the Finnish. There is a considerable Turkish literature.

*Government.*—Formerly the government was an absolute despotism. An abortive parliamentary constitution granted in 1876 was restored by the Sultan, Abdul-Hamid II., in 1908, under pressure of the Young Turk party, aided by the army. The monarch, usually designated the Sultan, is regarded by the Turks as the caliph or head of Islam. His edicts bear the name of Hatti-sherif, and his government is often designated as the Sublime Porte. The public officers who conduct the administration under the Sultan are divided into three classes. The first class is that of law and religion, and at their head is the Sheik-ul-Islam, who governs a judicial and ecclesiastical body called the Ulemas. The second class consists of the "officials of the pen," or the members of administration, and at their head is the grand-vizier of Sadrazam. The third class includes the "official of the sword," at their head being the Seraskier or minister of war, and the Capudan Pasha or minister of marine. The supreme deliberative body is the divan or privy-council, with the grand-vizier at its head, other members being the Sheik-ul-Islam and the ministers of war, marine, finance, justice, education, commerce, etc. The immediate possessions of the Turkish empire are divided into general governments or vilayets, at the head of each of which is a governor bearing the title of vali. The vilayets are themselves subdivided into sanjaks, administered by mutessarifs; and these again into kazas administered by kaimakams. For defense, see *Armies of the World* under ARMY; and *Navies of the World*, under NAVY.

*Religion and Education.*— The established religion of Turkey is Mohammedanism, but Christianity under the Greek form is professed by a large majority of the Greeks and Bulgarians, while part of the Albanians are Roman Catholics. The educational system of Turkey, in accordance with the law of 1869, provides for the erection of elementary schools in every commune, and of secondary schools in the larger towns, while at Constantinople in 1870 a university was opened. There are besides law, military, and medical schools in that city.

*History.*— The earliest notice of the Turks or Turcomans, in history is about the year 800, when, issuing from various parts of Turkestan, they obtained possession of a part of Armenia, called from them Turcomania. They afterward extended their conquests over the adjacent parts of Asia, Africa, and Europe, occupying Syria, Egypt, and eventually the territory that remained to the Greek empire. In 1453 Constantinople was taken by Mohammed II., and became the capital of the empire. The Morea and the Islands were afterward overrun, with parts of Hungary, the Crimea, and the shores of the Black Sea. They next took the whole of the country now forming Turkey in Asia, the Hezja in Egypt, and the regencies of Tripoli, Tunis, and Algiers. From the accession of Mohammed IV. in 1648, the Turkish empire began rapidly to decline, the vice and profligacy of the harem and seraglio being reflected in every branch of the State. The shelter given to Charles XII. of Sweden, in 1711, led to the first war with Russia, which must have ended in the ruin of that empire but for the cupidity of the grand-vizier, who accepted a bribe to allow Peter the Great and his army to escape.

From that time till 1774 the war with Russia was frequently renewed, and, by the peace of the latter year, a large extent of territory and the Black Sea were ceded by the Porte to Russia. In the campaign of 1787 the Turks were still more unfortunate, and, though in 1789, under Selim III., they retook Belgrade, they were elsewhere defeated. In 1807 the Emperor Alexander declared war against the Porte, and in the campaign advanced his frontier to the Pruth by the conquest of Bessarabia; the next severe loss the Turks sustained was from the revolt of the Greeks and the subsequent independence of their country. In 1854 war was once more declared against Turkey by Russia, when England, France, and Sardinia joined the Porte to enable the

Sultan to resist the threatened invasion of his dominions; the burning of the Turkish fleet off Sinope, the campaign on the Danube, the battles of Alma, Inkerman, Balaklava, and the bombardment and capture of Sebastopol, were some of the results of the two years' war with Russia; Turkey, for the first time in nearly a century, sheathing the sword without the loss of a foot of territory. Subsequently, Turkey engaged in a war with the Montenegrins, who sought to cast off her yoke; and, later, was concerned in suppressing revolutionary tendencies in the Danubian principalities. In 1875, an insurrection broke out in Herzegovina, and in October, Turkey declared her partial insolvency.

In February, 1876, the six great European Powers proposed a scheme of reform which was largely accepted by the Sultan. On May 30 Sultan Abdul-Aziz was deposed. His nephew, Murad V., succeeded him, but was also deposed and followed, Aug. 31, by his brother, Abdul-Hamid II. On Jan. 18, 1877, the Grand Council of Turkey refused all interference by the European Powers and Russia declared war on April 21. Turkey was badly beaten and an armistice was signed in February, 1878. The terms of the treaty of peace at San Stephano (March 3) were subsequently modified at the Congress of Berlin. In 1897 Turkey defeated Greece in a short war, and in 1909 the Young Turks' party got up a revolution, deposed Abdul-Hamid, and called Mohammed V. to the throne. For further details in the recent history of Turkey, see ARMENIA, CRETE, GREECE. The following is a list of the Sultans of Turkey (House of Othman):

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|---|---|
| Othman, or Osman I. .....1299 | Osman I.....1618 |
| Orchan .....1326 | Amurath IV., "The Intrepid," .....1623 |
| Amurath I.....1360 | Ibrahim .....1640 |
| Bajazet I., "The Thunderbolt," ..1389 | Mohammed IV....1649 |
| Solyman I.....1402 | Solyman III.....1687 |
| Mohammed I.....1413 | Achmet II.....1691 |
| Amurath II.....1421 | Mustapha II.....1695 |
| Mohammed II. (Conqueror of Constantinople) .1451 | Achmet III.....1703 |
| Bajazet II.....1481 | Mahmoud I.....1730 |
| Selim I.....1512 | Osman II.....1754 |
| Solyman II., "The Magnificent," ..1520 | Mustapha III.....1757 |
| Selim II.....1566 | Abdul Hamid ....1774 |
| Amurath III.....1574 | Selim III.....1788 |
| Mohammed III....1595 | Mustapha IV.....1807 |
| Achmet I.....1603 | Mahmoud II.....1808 |
| Mustapha I.....1617 | Abdul-Medjid ....1839 |
| | Abdul-Aziz .....1861 |
| | Murad V.....1876 |
| | Abdul Hamid II...1876 |
| | Mohammed V.....1909 |

**Turkey,** in ornithology, any species of the genus *Meleagris.* They are the largest of the game birds, and for that reason have been domesticated for a great length of time. All the species have the head naked, with wattles or folds of bright naked skin, which becomes much more brilliant when the bird is excited or angry, and a curious tuft of long hair on the breast. The plumage is always more or less metallic. The common turkey, *Meleagris gallopavo,* is brownish-yellow on the upper parts of the body, and each feather has a broad resplendent black edge, hinder portions of the back feathers and tail coverts dark reddish-brown, striped with green and black; breast yellowish-brown, darkest at sides; belly and sides brownish-gray; rump feathers pale black, with a darker edge; fore parts of head and throat pale sky blue, warts on face bright red. They often weigh from 20 to 60 pounds, and measure at least three feet in height; but the wild birds are much finer than the domesticated race, which, contrary to the general rule, has degenerated under the care of man. They are gregarious, and inhabit the E. portion of North America, feeding on grass, grain, insects, fruit, etc. The domesticated birds may be seen in every farm yard, and large numbers are bred and fattened. The ocellated turkey, *M. ocellata,* a very fine and brilliantly-colored species, having eyelike markings on the tail feathers and upper wing coverts, is found in Honduras and Yucatan. The other species, *M. mexicana,* from Central America, Mexico, and the table-lands of the Rocky Mountains, closely resembles *M. gallopavo,* and is popularly known as the Mexican turkey.

According to Edgar Richardson, the name of the bird described above is not derived from the country of Turkey, but through the Hebrew *tukki* = a peacock, from the Tamil *toka* = a peacock. The bird is a native of America, and when first carried to Europe was taken to Spain on the return of the expeditions of Hernando Cortez. There the curiosities and products of the new world were handled by the Jews, who then, as now, were commercial people. When the bird was shipped to England about 1541, its Hebrew name followed it, and was easily corrupted by the English by the interpolation of an *r,* and thence to its present spelling. The similarity of the spellings of the country and the name of the bird seem to have misled popular belief to the idea that the fowl was a native of the Turkish empire and took its name thence.

**Turkey Buzzard,** or **Turkey Vulture,** the *Rhinogryphus* (*Cathartes*) *aura.* Like the other vultures, they feed on carrion, but their habits vary somewhat with locality; in the Southern United States they act as scavengers in the towns; in Guatemala and throughout South America they are not seen in flocks, but occur in pairs only in the forests.

**Turkey Carpet,** a carpet made entirely of wool, the loops being larger than those of Brussels carpeting and always cut. The cutting of the yarn gives it the appearance of velvet.

**Turkey Company,** a company instituted by charter received from Queen Elizabeth in 1579. Called also the Levant Company.

**Turkey Red,** one of the most beautiful and most durable colors which has yet been produced on cotton. It is obtained from madder by a very complicated process, the theory of which is not perfectly understood. The four most essential operations are: thorough washing of the unbleached calico, impregnating it with an oily soap, mordanting with alumina, and immersing in a decoction of madder containing chalk and bullock's blood.

**Turkey River,** a river in Northeastern Iowa; formed by the union of two small streams. It flows S. E. through Clayton county and empties into the Mississippi, 10 miles below Guttenberg. It is about 90 miles long, or, including its branches, 150 miles. Galena limestone abounds near its banks.

**Turkey Stone,** a very fine-grained siliceous slate, commonly of a greenish-gray sometimes of a yellowish or brownish gray color. When cut and polished it is used for sharpening small cutting instruments.

**Turkish Bath,** a popular form of hot air bath, in which the patient, after being subjected for some little time to a considerable temperature, is vigorously rubbed down, and is then conducted through a series of cooling chambers till he has regained his normal temperature. All secretions and accretions are thus completely removed from the skin, which is left free to perform its functions healthily.

**Turkish Greyhound,** a small-sized dog, somewhat resembling an English greyhound in shape, but entirely hairless, or with only a few hairs on the tail. It is of no value as a sporting dog, but makes a faithful and affectionate pet.

**Turkomans,** a nomadic Tartar people occupying a territory stretching between the Caspian Sea and the Sea of Aral, the khanates of Khiva and Bokhara, Afghanistan, and Persia. They do not form a single nation, but are divided into numerous tribes or clans.

**Turks,** an important and widespread family of the human race; found from the banks of the Lena through Central Asia and Asia Minor to the European shores of the Bosporus and the Ægean. Formerly classed among the Turanian peoples, it is now more usual to say that they are of the Mongolo-Tartar ethnological group, and speak languages of the Ural-Altaic family. To them belong at the present day Yakuts, Siberian Tartars, Kirghizes, Uzbegs, Turkomans, Karakalpaks, Kazan Tartars, and Dungans, as well as the Ottoman Turks; linguistically the Bashkirs and Tchuwashes fall under the same head. The existing Turkish peoples are all Moslems, except the Yakuts, and mostly nomadic. They have given ruling families or races to China, Persia, India, Syria, Egypt, and the empire of the Caliphs.

**Turmeric,** the rhizome or rootstock, usually having pointed cylindrical branches, of *Curcuma longa* (natural order *Zingiberaceæ*). This species of *Curcuma* is a handsome herbaceous plant, the flowering

TURMERIC: CURCUMA LONGA.
a, root; b, spike of flower; c, leaf before expansion (Bentley and Trimen).

stem of which has long, narrow, sheathing leaves, and above these a leafy spike of yellow flowers. It is cultivated all over India, but it is also grown in the East Indian Islands, China, and the Fijis. The tubers, which are yellowish externally, yield a deep yellow powder of a resinous character. Turmeric has been long employed in the East as a medicine, and as a yellow dye which can be changed into a deep, brownish red by alkalies, but neither color is permanent. It is a principal ingredient in some Indian articles of food, including curry powder. In W. countries it is not now much used in dyeing, nor in medicine, but it is very useful as a chemical test for the presence of alkalies, any alkaline substance quickly changing its color from yellow to reddish brown. Mustard is frequently adulterated with turmeric, and so also are some other substances. Turmeric has an aromatic taste and a peculiar odor not unlike that of ginger. The odor is due to an essential oil called turmerol, of which the tubers contain about 1 per cent.; and the coloring principle is known as curcumin. African turmeric,

brought from Sierra Leone, is obtained from a species of canna.

**Turn Buckle.** (1) A form of shutter fastening having a gravitating catch. (2) An analogous device used for securing the free ends of the implement chains in a gun carriage and the cover of the ammunition chest. (3) A link used for setting up and tightening the iron rods employed as stays for the smoke stack of a steamer or for similar objects.

**Turnbull, Frances Hubbard Litchfield,** an American author; born in New York State; was educated principally by private instructors at home and in Europe. In 1890 she was one of the founders of the Woman's Literary Club of Baltimore, of which she was president for seven years. In the same year with her husband she established at Johns Hopkins University the Percy Turnbull Memorial Lectureship of Poetry in memory of a son. Her publications include "The Catholic Man" (1890); "Val-Maria, a Romance of the Time of Napoleon" (1893); "The Golden Book of Venice, a Historical Romance of the 16th Century" (1900); "Sidney Lanier; a Study in Douglas Sladen's Younger American Poets" (1891); etc.

**Turnbull, Laurence,** an American physician; born in Shotts, Scotland, Sept. 10, 1821; was graduated at the Philadelphia College of Pharmacy in 1842 and then became a manufacturer of chemicals. He discovered how to produce citrate of iron and biborate of sodium which would bleach colored ointments and oils. He was graduated at the Jefferson Medical College in 1845; was vaccine physician of Philadelphia in 1847–1850. When the Civil War began he became a volunteer surgeon on the Potomac flotilla. Later he became a specialist in diseases of the ear and was appointed aural surgeon of the Jefferson College Hospital. His publications include "The Electro-Magnetic Telegraph, with an Historical Account of its Rise, Progress, and Present Condition" (1859); "Defective and Impaired Vision, with the Clinical Use of the Ophthalmoscope in their Diagnosis and Treatment" (1859); "Hints and Observations on Military Hygiene" (1862); "Imperfect Hearing and Hygiene of the Ear" (1871); "A Clinical Manual of the Diseases of the Ear"; etc. Died in 1900.

**Turnbull, Robert,** an American clergyman; born in Scotland, Sept. 10, 1809; came to the United States in 1833; was editor of the "Christian Review" for two years. Among his many books are: "The Theater" (1840); "Olympia Morata" (1842); "The Genius of Scotland" (1847); "The Genius of Italy" (1849); "Theophany" (1851); "Pulpit Orators of France and Switzerland" (1853); "The Student Preacher" (1854); "The World We Live In" (1855); "Christ in History" (1856); "Life Pictures; or, Sketches from a Pastor's Note-Book" (1857). He died in Hartford, Conn., where he was for many years a pastor, Nov. 20, 1877.

**Turndun,** a small, fish-shaped piece of thin, flat wood, tied to a thong, and whirled in the air to produce a loud roaring noise, whence it is sometimes called a bull roarer. This instrument is used by the natives of Australia to call together the men, and to frighten away the women from the religious mysteries. The turndun is employed for similar purposes in New Mexico, South Africa, and New Zealand. In the Mysteries of Dionysos the ancient Greeks used a kind of turndun, which they called *rhombos*, probably identical with the "mystica vannus Iacchi."

**Turner, Charles Tennyson,** an English poet; brother of Lord Alfred Tennyson; born in Somersby, Lincolnshire, July 4, 1808. He assumed the name of Turner (1835) by royal license, having inherited some property from his great uncle, Rev. Samuel Turner. Besides "Poems of Two Brothers," written in collaboration with Alfred, he wrote: "Sonnets and Fugitive Pieces" (1830); "Sonnets" (1864); "Small Tableaux" (1868); "Sonnets, Lyrics, and Translations" (1873); "Collected Sonnets, Old and New" (1880). He died in Cheltenham, England, April 25, 1879.

CHARLES T. TURNER.

**Turner, Charles Willard,** an American lawyer; born in Boston, Mass., Feb. 23, 1844; was graduated at Amherst College in 1865; admitted to the bar in 1867; practised in 1867–1892; then became Professor of Law at the University of Tennessee, and Professor of Constitutional History there in 1905. He was the author of "Syllabi of Work in Evidence, Insurance, and Domestic Relations" (1900); and a "Paper on the Paston Letters."

**Turner, Frederick Jackson,** an American educator; born in Portage, Wis., Nov. 14, 1861; was graduated at the University of Wisconsin in 1884, and pursued studies in history at Johns Hopkins University. Subsequently he became Professor of American History at the University of Wisconsin, and director of its School of History. He was the author of "The Indian Trade in

Wisconsin" (1890); "Significance of the Frontier in American History" (1893); "The West as a Field for Historical Study" (1896); "Western State-Making in the Revolutionary Era" (1895); "The Origin of Genet's Projected Attack on Louisiana and the Floridas" (1898); "Documents Illustrative of Genet's Proposed Expedition Against Louisiana and the Floridas" (1897); "Dominant Forces in Western Life"; etc.

**Turner, Joseph William Mallard,** an English landscape painter; born in London, England, April 23, 1775. Early evincing a marked predilection for art, he, in 1789, entered as a student at the Royal Academy, where he studied assiduously for three years, and produced some of his minor pictures. In 1799, he was elected A. R. A., and, in 1802, became R. A. Down to this period he was principally known as a painter in water-colors. Turning his attention to oils, he during the next half century exhibited more than 200 pictures, including some reproductions of nature of marvellous skill and beauty. Among his best works are: "The Wreck;" "The Old Temeraire"; "The Burial of Wilkie"; "The Death of Nelson"; "Ulysses Deriding Polyphemus"; "Crossing the Brook"; "Rome"; "Venice"; "Sun Rising Through a Mist"; "Wreck of the Minotaur"; "Bay of Baiæ"; "Dido Building Carthage"; "Calais Pier," etc. Turner, who has been styled the "English Claude," combined in his works comprehension and truth to nature. As a colorist, Turner ranks among the best painters of modern times. Unsocial and peculiar in his habits — penurious indeed — Turner, in all that related to art, exhibited the most extended munificence. He bequeathed the greater bulk of his large fortune to found almshouses for the benefit of reduced artists, and left his unsold pictures — many of them among his choicest examples — to the British nation. These works, about 100 in number, form the contents of the "Turner Room," in the National Gallery, London. He died in London, Dec. 19, 1851.

**Turner, Sharon,** an English historian; born in London, Sept. 24, 1768. The first fruits of his historical investigations appeared as "History of the Anglo-Saxons" (vol. i. 1799), and at once established his reputation. He continued his narrative down to the reign of Elizabeth, the last volume of the series being published in 1829. Among his minor productions may be maintained, "Inquiry Respecting the Early Use of Rime" (1802); "A Vindication of the Genuineness of the Ancient British Poems of Aneurin, Taliesin, etc." (1803), which was called forth by the strictures of the "Critical Review" (1800), on the first volume of his history, "Sacred Meditations" (1810), and "The Sacred History of the World" (1832). He died in London, Feb. 13, 1847.

**Turner, Thomas,** an American naval officer; born in Washington, D. C., Dec. 23, 1808; joined the navy in April, 1825; was promoted lieutenant in 1835. He served on the frigate "Columbia," the flagship of the East Indian squadron in 1838–1841; took part in the destruction of Mucke and Quallat Rattoo, Malay pirate towns on the island of Sumatra in January, 1839; was commander of the storeship "Fredonia" of the Gulf squadron in 1847. In April of that year he commanded the "Reefer" in the assault on Tuspan; was promoted commander in September, 1855. He captured the steamers "Miramon" and "Marques de Habana" in March, 1860. These ships had been bought in Spain and were used by the Mexican revolutionary party to blockade the port of Vera Cruz. After the outbreak of the Civil War he commanded the "New Ironsides" in the South Atlantic squadron, and distinguished himself in 1863 in assaults on the forts of Charleston, S. C.; was promoted commodore in 1862, and rear-admiral in 1868, and was retired in April, 1870. He died in Glen Mills, Pa., March 24, 1883.

**Turnera** (named by Linnæus after William Turner, Prebendary of York, who published a "New Herbal" in 1561, and died in 1568), the typical genus of *Turneraceæ;* herbs or under-shrubs, with more or less deeply-divided leaves, each with two glands at the base. Flowers generally single and axillary, rarely racemose and terminal; calyx five-parted, colored; petals and stamens five; capsule one-celled, with three parietal placentæ, bursting into three pieces. From the West Indies and South America. The herbage of some species is aromatic. *T. opifera* is astringent, and is given in Brazil against dyspepsia. *T. ulmifolia* is considered tonic and expectorant. *T. aphrodisiaca* furnishes the Damiana of the United States pharmacopœia. It is a powerful aphrodisiac.

**Turnerite** (after C. M. Turner, of Rooksnest, Surrey, England), a variety of Monazite, occurring in small crystals associated with adularia, etc., in the department of l'Isère, France, and also in Switzerland. Hardness, above 4.0; luster, adamantine; color, mostly shades of yellow; transparent to translucent.

**Turning,** the art of shaping wood, metal, ivory, or other hard substances into forms having a curved (generally circular or oval) transverse section; and also of engraving figures composed of curved lines on a smooth surface, by means of a machine called a turning lathe. The immense variety of work performed by turning machines necessitates great variations in their construc-

Turnip

tion; but their mode of operation is always the same, and consists in fixing the work in position by two pivots or otherwise, causing it to revolve freely round an axis of revolution of which the two pivots are the poles, and holding a chisel or other cutting tool so as to meet it during its revolution, taking care that the cutting tool be held firmly and steadily, and moved about to different parts of the work till the required shape be obtained. Lathes are divided, with respect of the mode of setting them in motion, into pole lathes, foot lathes, hand-wheel lathes, and power lathes; with respect to the species of work they have to perform, into center lathes, which form the outside surface, and spindle, mandrel, or chuck lathes, which perform hollow or inside work, though this distinction is for the most part useless, as all lathes of good construction are now fitted for both kinds of work. Bed lathes are those used by turners in wood, and bar lathes for the best sort of metal work; and the small metal center lathe used by watchmakers is known as a turn bench.

**Turnip,** a biennial plant, with lyrate hispid leaves; the upper part of the root becoming, especially in cultivation, swollen and fleshy. It is a native of Europe and the temperate parts of Asia, growing in borders of fields and waste places. It is commonly regarded as a native of Great Britain, though in most cases where it is found apparently wild it may be doubted if it has not derived its origin from cultivated varieties. It has been long cultivated, and is to be found in every garden of the temperate and cold parts of the world as a culinary esculent; it is also extensively grown in fields for feeding cattle and sheep. It was cultivated in India long before it could have been introduced by Europeans, and is common there in gardens and about villages. The cultivated varieties are very numerous. In them the upper part of the root assumes a globose, oblong, or roundish depressed form. Some are common to the garden and the farm, and some of the largest kinds attain such a size as to weigh 20 or 25 pounds. Though the turnip is of great value for feeding stock, it is not very nutritious, no less than 90 to 96 parts of its weight actually consisting of water.

Garden turnips are sown from the end of March to the end of August; field turnips generally in June, it being requisite that they should not be sown so soon as to incur a risk of their throwing up flower stems in the first year, which, when it takes place, prevents in a great measure the swelling of the root and renders it coarse and fibrous. In dry weather the plants are apt to throw up flower stems, and so disappoint the hope of the gardener. Moist cloudy weather is most favorable. Garden turnips are sown and allowed to grow much closer than field turnips, being gradually thinned out, and the thinnings used even when of small size. The garden turnips are generally of comparatively small size, more rapid in growth, and more delicate. The Swedish turnip, or ruta baga, which was introduced into cultivation in Great Britain, from the N. of Europe, more recently than the common turnip, and has proved of great value to the farmer, is regarded by some botanists as a variety of the same species, and by some as a variety of *B. napus,* but more generally as a variety of *B. campestris,* a species common in cornfields and sides of ditches in Great Britain and the N. of Europe.

The cultivated turnip grows best in a rich free soil. The mode of culture varies with the soil. Where the soil is light and dry a smaller amount of plowing, harrowing, and drilling is necessary than on stiff soils. The turnip is not well suited to clay soils, though it is often grown on them. A complete pulverization of the soil is requisite before the sowing of the seed. On light soils a crop of turnips generally succeeds wheat or oats. Turnip land is generally made up in raised drills by the plow, and the seed is sown by the drilling machine on the top of the narrow ridges, which are about 27 inches wide. Moderate dressings of artificial manure, such as superphosphate of lime, crushed or dissolved bones, kainit and nitrate of soda, or other such manures, produce great crops of turnips. The more general practice, however, is to give a mixed dressing of farmyard dung and artificial manure. The young plants are thinned out by the hand hoe to from 9 to 11 inches apart, and the ground is stirred and carefully kept clean by the plough or horse hoe. The turnip crop is thus of great use in clearing the land of weeds. In many places part of the crop is eaten on the ground by sheep, which are confined to a small part of the field by means of movable fences. It is common to leave one of each three rows of turnips for this purpose, the other two rows being carried to the farmyard for feeding cattle or stored. Turnips are stored either in a house or in conical heaps, covered with straw and earth. They are sometimes protected from frost by being earthed up in rows by the plow. Some kinds are much more easily injured by frost than others; the Swedish turnips least of all.

The introduction of the turnip as a field crop is one of the most important events in the history of British agriculture. It has rendered possible a rotation of crops which has been extremely advantageous, and has made the supply of butcher meat more constant, by providing a supply of winter food for cattle and sheep, whereas formerly all depended on the pasture. As a field crop turnips were not raised in Great Britain till the end of the 17th century. Turnip

husbandry was introduced into Roxburghshire from Leicestershire about the year 1764, but was soon carried to a perfection in Scotland far beyond what it had previously reached. The climate of Scotland is well adapted for it, as is also that of Ireland. Turnip crops in Great Britain suffer very much from the two distinct diseases called anbury, or club root, and finger-and-toe. Superior culture is the best means of preventing these diseases. Plants weakened by drought are liable also to suffer from a white mould, a species of Oidium, which attacks the leaves and greatly injures the plant.

The turnip crop has to encounter many insect enemies. The most destructive in recent years has been the turnip fly (*Phyllotreta nemorum,* Chevrolat), which devours the young plants before they are strong enough to be thinned. The leaves of the young turnip plants are also attacked and often much injured by the green fly or turnip aphis (*Aphis rapæ,* Curtis); by the maggots of two kinds of Diptera — *Phytomyza nigricornis,* (Macquard) the black-leaf miner, and *Drosophila plana,* (Fallen) the yellow-leaf miner; by the caterpillar of the diamond-back turnip moth (*Cerostoma xylostella,* Curtis); by the caterpillar of the common dart moth (*Agrotis segetum,* Westwood); by the grubs of the turnip sawfly (*Athalia spinarum,* Fabricius); and by at least two varieties of weevil, Curculio, the most destructive being the little Curculio, *Centorhynchus contractus,* 1-14 inch long, which punctures the seed leaves with its rostrum. The diamond back moth fortunately seems to pay its visits of destruction at long intervals. It played great havoc with the crop in England and Scotland in 1891, destroying it beyond recovery in many parts. In Ireland the attack was lighter. Earlier serious attacks occurred in 1851, 1837, and 1826. For all insect attacks the best preventive measure is a dressing of stimulating manure to force on the growth of the plants. Spraying the crop with a mixture hurtful to the insects, by means of the Strawsoniser, an air-power distributor, is also recommended.

**Turnip Flea,** or **Turnip Jack,** the *Haltitica* (or *Phyllotreta*) *nemorum;* owes its popular name to its leaping or skipping powers, but is really a very small beetle, with long and strong hind legs and ample shining black wings, with two yellowish stripes down the wing cases, and ocherous legs. It commits great ravages in turnip fields by devouring the seed leaves as soon as they appear above ground. The female lays her eggs on the underside of the leaf, in which the larva mines, and makes a tortuous gallery.

**Turnip Fly,** a popular name for two insects which are quite distinct, and belong to different orders, but are both destructive to turnips. (1) *Athalia centifolia,* a hymenopterous insect, the larva of which is known by the popular name of "nigger," on account of its black color; (2) *Anthomyia radicum,* a two-winged fly of the family *Muscidæ.* The larvæ live on the roots of the turnip, often doing great damage.

**Turnix,** in ornithology, the type genus of *Turnicidæ,* with 23 species, having the characteristics and range of the family. They frequent open plains, stony tracts covered with grass, or mountain sides, and are exceedingly shy except at the breeding season, when they become exceedingly pugnacious, the hens being as jealous and combative as their mates, and some of the Asiatic species are trained, like fighting cocks. They nest on the ground under a tussock of grass, and the female lays four pear-shaped eggs.

**Turnpike,** a gate that may be set across a road, and watched by a person appointed for the purpose, in order to stop carriages, carts, wagons, etc., and sometimes travelers, till toll is paid, for the cost and repair of the road. Such roads are called turnpike roads, or simply turnpikes, and formerly were common in the American Atlantic States, but tolls on roads have now been almost entirely abolished.

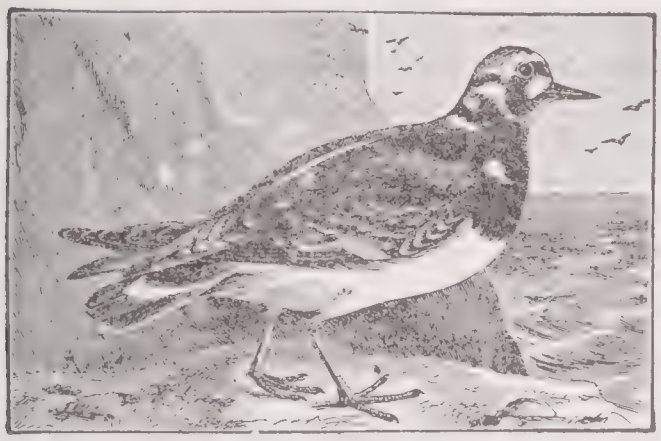
**Turnspit,** a name given to a variety of terrier dogs, from their being trained to turn the spits or roasting jacks in mansions. The breed is now practically extinct.

**Turnstile,** a post surmounted with four horizontal arms, which revolve as a person pushes by them. Turnstiles are usually placed on roads, bridges, or the like, either to prevent the passage of beasts, vehicles, or the like, while admitting the passage of persons, or to bar a passage temporarily till toll is paid; they are also frequently placed at the entrance to public buildings, or places of amusement, where entrance money is to be collected, or where it is desired to ascertain the number of persons admitted.

**Turnstile Register,** a devise for registering the number of persons who pass through a turnstile at the entrance to a toll bridge or building, and serving as a check on the collector.

**Turnstone,** the *Strepsilas,* a small genus of birds of the plover family (*Charadriidæ*), intermediate between the true plovers and sandpipers. The common turnstone (*S. interpres*) appears in Great Britain as a winter migrant, but is not known to breed there; its breeding places being the shores of the Arctic Ocean in Europe, Asia, and America, though it breeds on the coasts of Scandinavia down to Denmark, laying four eggs of a greenish-gray color, spotted and streaked with bluish-ash and brown, in a shallow depression lined with a few

dry leaves and bents. In winter the turnstone is found on the seashore all over the world, being probably the most cosmopolitan of all birds. It derives its name from its habit of turning over stones with its bill in search of its food, which consists of small crustaceans and mollusks. The common turnstone is nine inches in length, and is handsomely marked with black, white, and chestnut; the last-named color is reduced in autumn, when the plumage becomes duller; the legs and feet are orange. Another species, the black-headed turnstone (*S. melanocephalus*), breeds in Alaska and winters in California; and some place the surf-bird (*Aphriza virgata*) in this genus.



THE TURNSTONE.

**Turn Table,** in railway engineering, a platform which rotates in a horizontal plane, and is used for shifting rolling-stock from one line of rails to another. Devices common to all are the platform, which has one or more tracks of rails on its upper surface; rollers on which it turns, gearing for rotating it, a central pivot on which it rotates, a circular track on which the rollers move, and solid foundations for this track and for the central pivot. One common form consists of a platform centrally supported on a series of frusto-conical rollers turning on arms radially projecting from a collar, which revolves around the axis of the table. The apexes of the cone would, if they were complete, meet at a point in their axis. They are interposed between two annular castings correspondingly beveled, the lower of which is fixed, and serves as a track, and the upper is attached to and turns with the table. Flanges on the inner ends of the rollers prevent their being pushed outwardly by the pressure. In a modified arrangement, small conical rollers, turning between the large rollers and plates on the ends of the arms which carry them, are substituted for the flanges. Adams' turn table floats in a water tank. In microscopy, a device on which a slide is held and revolved for tracing the circular cement-cells in which objects are placed for examination.

**Turonian,** of or belonging to the Turones, an ancient people of Celtic Gaul; of or belonging to Touraine, the modern name of their country, Tours its great city, or the rocks there developed. In geology, the French equivalent of part of the English Lower White Chalk without flints.

**Turpentine,** the name applied to turpentine oil, and to the crude oleo-resinous juice which exudes from incisions in the bark of pines, firs, and other coniferous trees. The species which chiefly furnish common turpentine are *Pinus palustris, P. tæda,* and *P. pinaster.* The oleo resin flowing from them has the consistence of molasses, is of a pale-yellow color, with a pungent odor and taste peculiar to itself. It alters much with heat and exposure. Strasburg turpentine is from *Abies pectinata.*

**Turpentine Camphor,** a term applied, sometimes to the solid monohydrochlorate, sometimes to the solid hydrate of turpentine oil.

**Turpentine Oil,** the volatile oil distilled from crude turpentine, and existing in the wood, bark, leaves, and other parts of coniferous trees. These oils, according to the source from which they are obtained, exhibit considerable and marked diversities in their physical as well as in their optical properties. The several varieties when rectified are colorless, mobile liquids, having a peculiar aromatic but disagreeable odor. They are insoluble in water, slightly soluble in aqueous alcohol, miscible in all proportions with absolute alcohol, ether, and carbon disulphide. They dissolve iodine, sulphur, phosphorus, also fixed oils and resins. The two principal varieties are from *Pinus maritima,* and from the turpentine collected in the Southern States of America. The former has a sp. gr. of 0.864, boils at 161°, and turns the plane of polarization to the left; the latter has the same specific gravity and boiling point, but turns the plane of polarization to the right. Both oils absorb oxygen from the air, and acquire powerful oxidizing properties from the probable formation of an organic peroxide, $C_{10}H_{14}O_4$. Turpentine absorbs chlorine with such energy as sometimes to set it on fire. It belongs to a group of volatile oils to which the name of terpenes has been given. They are derived from the plants of the coniferous and aurantiaceous orders, yielding, for example, turpentine and lemon oils respectively. Turpentine oil is of great importance in the arts, and is specially employed for giving consistency to oil paints and varnishes, conferring on them drying properties.

In pharmacy, in small doses it is absorbed and acts as a stimulant, antispasmodic, and astringent. It produces diuresis, and communicates to the urine passed a smell

like that of violets. It can arrest hemorrhage in the capillary vessels. It is generally administered as an enema to destroy tænis, ascarides, etc., in the intestines. Applied externally, it is a powerful rubefacient.

**Turpentine Shrub,** in botany, the *Silphium terebinthaceum,* the prairie burdock, a tall herbaceous plant with large, cordate, radical leaves, and bright yellow flowers. It is a native of North America.

**Turpentine State,** North Carolina, which annually sends vast quantities of turpentine to market.

**Turpentine Tree,** the name given to some species of trees of the genus *Pistacia,* natural order *Anacardiaceæ,* which yield turpentine, as the *P. Terebinthus,* the Chian or Cyprus turpentine tree, *P. lentiscus,* the Mount Atlas mastic or turpentine tree, etc.

**Turpentine Vessels,** in botany, tubes formed in the interstices of tissue in the *Conifers,* and into which turpentine or other secretions naturally drain during the growth of these trees.

**Turpeth,** the root of *Ipomæa turpethum,* found wild throughout India and Ceylon to a height of 3,000 feet. The Sanskrit writers mention two varieties of the plant, a white and a black one. The first is unidentified, the last is given by the natives of India as a drastic purgative in rheumatic and paralytic affections.

**Turpethic Acid,** $C_{34}H_{60}O_{18}$; an amorphous yellow mass, produced by the action of bases on turpethin. It has an acid reaction and bitter taste, is soluble in water, and resolved by mineral acids into glucose and turpetholic acid.

**Turpethin,** $C_{34}H_{56}O_{16}$; a purgative resin, extracted from the root of *Ipomœa turpethum* by alcohol. It has a brownish yellow color, is inodorous, insoluble in water and ether, soluble in alcohol, and melts at 183°. In concentrated sulphuric acid it slowly dissolves, forming a red solution.

**Turpeth Mineral,** in chemistry, $H''gSO_4 \cdot 2Hg_2O$, basic mercuric sulphate, a lemon-yellow powder obtained by boiling mercuric sulphate with water, or by adding a solution of sodic sulphate to a hot dilute solution of mercuric nitrate. It is very slightly soluble in cold, more so in hot water, turns gray on exposure to the air, and when heated is resolved into mercuric sulphate and mercuric oxide.

In painting, a pigment of a beautiful lemon-yellow color, but so liable to change by the action of light or impure air that, notwithstanding it has been sometimes employed, it cannot be used safely, and hardly deserves attention.

**Turpetholic Acid,** $C_{16}H_{32}O_4$; an inodorous substance prepared from turpethin by boiling with mineral acids. It crystallizes in slender microscopic needles, soluble in alcohol, slightly soluble in ether, and melts at 88°, decomposing at a higher temperature.

**Turpin,** a French clergyman; Archbishop of Rheims, friend and companion of Charlemagne, the suppositious author of the "History of Charlemagne and Roland." According to Gaston Paris, this falls into two parts: the first (1050) dealing in five chapters with Charlemagne's conquest of Spain without reference to Roland; the second (early in 12th century) giving the legend of Roland, the treachery of Ganelon, Roland's heroic death at Roncevaux, and the king's vengeance on the Saracens. In the "Song of Roland" itself Turpin dies besides its hero, and is buried with him and Oliver at Blaye near Bordeaux. There was actually an Archbishop Tilpinus of Rheims (753–800); but there can be no doubt that the romance in its present form was put together in the first third of the 12th century, most probably with a view to the glory of St. James of Compostella. From internal evidence it has seemed to critics highly probable that Pope Calixtus II. either wrote or at least inspired the work himself while yet Guy de Bourgogne, Archbishop of Vienne. Turpin died Sept. 2, 800.

**Turpinia** (named after M. Turpin, a French naturalist and artist), in botany a genus of *Staphyleaceæ;* inflorescence in terminal panicles, calyx five-parted, petals five, inserted on a ten-lobed disk; stamens five; filaments awl-shaped; styles three; fruit three-celled, each cell with two or three seeds. Trees or shrubs from the West and East Indies. The fruits of some species are eaten. The leaves of *T. pomifera* are used in India as fodder.

**Turpitude,** a state of departure from the law of rectitude; moral deformity; shameful wickedness; inherent baseness or vileness of principle in the human heart; extreme depravity; baseness or vileness of words, thoughts, or actions.

**Turquoise,** an amorphous mineral occurring in reniform nodules and incrustations. Hardness, 6.0; sp. gr., 2.6–2.83; luster, waxy to dull; color, sky-blue, bluish-green, apple-green; streak, white; rarely sub-translucent, mostly opaque. Composition: Phosphoric acid, 32.6; alumina, 46.9; water, 20.5 = 100, whence the formula, $2Al_2O_3PO_5 + 5HO$. Probably the Callais, Callaina, and Callaica of Pliny. A gem stone much used in ancient times in Persia, and in prehistoric times by the ancient Mexicans under the name of chalchihuitl. Originally found in Persia, where the best stones for jewelry purposes are still obtained, though the locality of the Mexican chalchihuitl has lately been discovered.

**Turræa** (named after Turra of Padua, an Italian botanist, who died in 1607), in botany a genus of *Melieæ*. Calyx five-toothed, petals five, ligulate; stamens united into a tube; style one; ovary with 5, 10 or 20 cells. Ornamental trees or shrubs from Southern Africa, Madagascar, Mauritius, and the E. parts of India.

**Turret,** in architecture, a small tower attached to and forming part of another tower, or placed at the angles of a church or public building, especially in the style of Tudor architecture. Turrets are of two kinds — such as rise immediately from the ground, as staircase turrets, and such as are formed on the upper part of a building by being carried up higher than the rest, as bartizan turrets. In military antiquities, a movable building of a square form, consisting of 10 or even 20 stories, and sometimes 180 feet high, usually moved on wheels, and employed in approaches to a fortified place for carrying soldiers, engines, ladders, etc. In railways, the elevated central portion of a passenger car, whose top forms an upper story of the roof, and whose sides are glazed for light and pierced for ventilation.

**Turret Lathe,** in metal work, a screw-cutting lathe, having a slide provided with a polygonal block or turret, having apertures in each face for receiving dies, which are secured therein by set-screws.

**Turret Ship,** an ironclad ship of war, whose armament is mounted in one, or more than one, low circular tower or turret placed on the deck, and revolved by steam power. This arrangement affords a wide horizontal fire, and capability of firing the same guns on both sides of the ship — a great advantage over broadside guns, which can only be trained through small arcs. The maximum of offensive power and minimum of armored area are combined in a turret ship. The sides of the ship are made much lower than in broadside ironclads, and this reduction of surface enables the remaining portions to be very heavily armored, and guns of the weightiest nature to be carried. The advantages to be derived from the use of revolving turrets for land and coast defense were clearly pointed out by M. Baltard in a work published at Paris in 1831; T. R. Timby, of Saratoga, N. Y., caveated in 1843 the invention of a revolving turret of iron for use on land or water; Captain Ericsson designed in 1855 the "monitor type" of vessel; and about the same time Capt. Cowper Coles, of the British navy, contrived a turret system differing from Ericsson's in some important particulars. The United States adopted Ericsson's plan, while Cole's system was put in practice in the British navy. The "Monitor," designed by the former inventor, was launched early in 1862. Her deck was only 18 inches above the waterline, and on a metal ring in the center of the deck a turret (20 feet in diameter and 9 feet high) was placed, which had two ports for 11-inch guns, the whole rotating on a central spindle by steam. She proved a most formidable ship, and her name is now applied to all ironclads constructed on the same principle of low freeboard with gun turrets. Her defects were remedied in other monitors subsequently built. The "Dictator" class of British monitors carries 10 inches of plate iron (backed by 3 feet of oak) on the sides and 15 inches in the turret walls, which enclose two 15-inch guns. Some monitors have two, others three turrets. The "Mianotomoh" and "Monadnock," of the United States navy, have made successful voyages in the Atlantic and Pacific.

The chief disadvantages of these monitors, arising from the turrets being raised so little above the water, are that the guns cannot be used in heavy weather, for the ports must then be closed to keep out water, and that the revolution of the turrets is in danger of being stopped by a plunging fire from broadside guns directed to the junction of the turrets with the deck. Different classes of British ironclads carry Coles' turrets at an elevation considerably over that of American monitors. The turrets pass through the upper deck, and rest on a broad base and cone rollers on the deck below, rotation being effected by a winch or steam power. The "Monarch" (British) is a double-turreted full-rigged ship. The sister ship to this ironclad was the ill-fated "Captain," designed by Captain Coles, which foundered, owing to pressure of sail assisted by a heavy sea and a want of proper stability, off Cape Finisterre in September, 1870, with the loss of 500 lives, including that of the unfortunate designer. The class of turret ships for coast defense, of which the "Glatton" is the type, are mastless and sailless "breastwork monitors," having a low freeboard, an iron-plated deck, and one or more turrets commanding an all-round fire. The bases of the turrets are protected by a massive breastwork rising 6 feet from the hull, and the freeboard is thus heightened for a considerable portion of the vessel's length. Over the turrets a hurricane or flying deck is erected, which serves for the stowage of boats. The same general plan is followed in the much larger seagoing turret ships, of which the "Thunderer" or "Devastation" is a typical example. The "Thunderer" has a freeboard of 4 feet 6 inches, plated with 12 inches of iron, and two turrets (15 inches thick), each with two 35- or 38-ton guns. The "Inflexible" class are constructed on the "central citadel" principle, the middle part of the ship — embracing turrets (18-inch

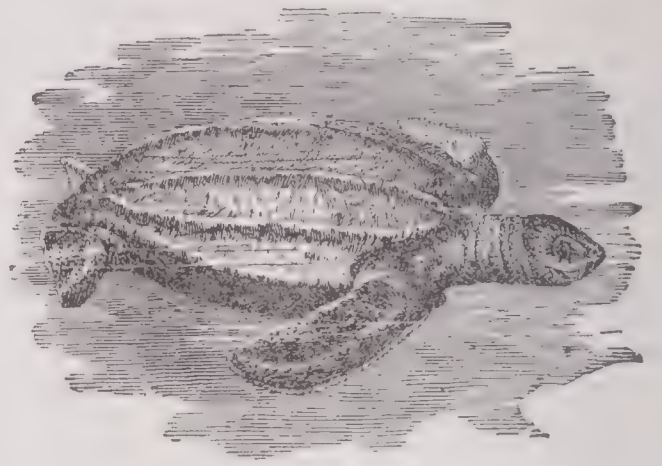
armor), machinery, and magazines — being protected by an iron citadel, 2 feet thick, extending from 6 feet below the waterline to 10 feet above it for a length of 110 feet. The turrets are placed diagonally, to command a fire ahead and astern as well as abeam. The ends before and abaft the citadel are unarmored, and serve to accommodate the crew and to carry coal. The armament consists of four 81-ton guns throwing a projectile weighing nearly three-quarters of a ton. The monster guns of these turret ships are loaded and worked by hydraulic machinery.

A system of superposed turrets was introduced in the United States, in the battleships "Kearsarge" and "Kentucky," but after thorough experiments, was condemned as unsatisfactory. In England and Europe the turret is used largely in land fortification; but in the United States it is displaced by the disappearing gun. See NAVY, UNITED STATES.

**Turritellidæ,** in zoölogy, a family of holostomatous *Gasteropoda*, with five genera. Shell tubular or spiral; upper part partitioned off; aperture simple; operculum horny, many-whorled. Animal with a short muzzle; eyes immersed at outer bases of the tentacles; mantle margin fringed; foot very short; branchial plume single. They appear to have commenced about the middle of the Jurassic period, abounding in the Tertiaries, and attaining their maximum in existing seas.

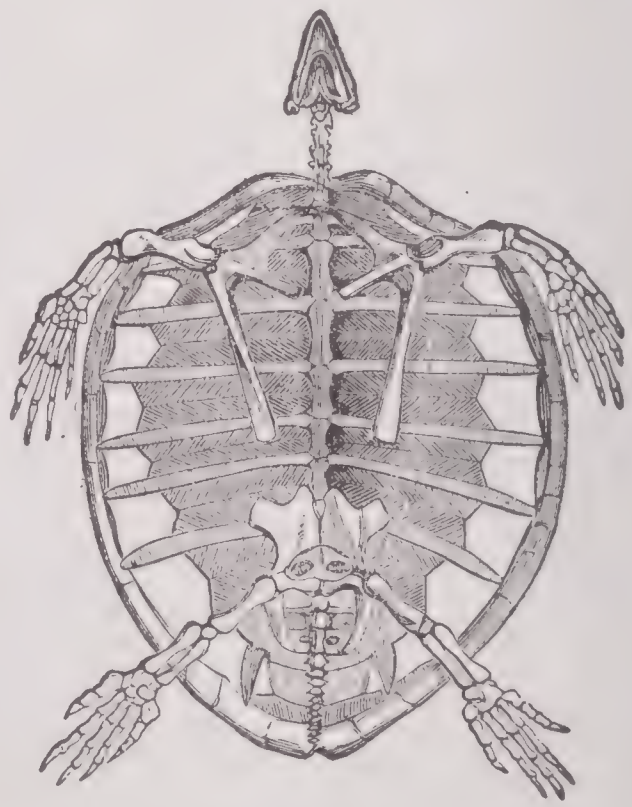
**Turritis,** in botany, tower mustard; a genus of *Arabidæ*, having the pod elongated, compressed, and two-edged, the valves nerved or keeled, the calyx nearly equal at the base. *T. glabra* (=*Arabis perfoliata*) is a *Crucifer*, with its stem one to two and a half feet high, with oblong, lanceolate, glaucous leaves, the radical ones toothed or sinuate at the base, the cauline ones sagittate; the flowers yellowish-white, the pods long and erect.

**Turtle,** in zoölogy, the popular name for any species of the *Cheloniidæ*. They may be distinguished by their long, compressed, fin-shaped, non-retractile feet, with the toes inclosed in a common skin, from which only one or two claws project. The carapace is broad and much depressed, so that when these animals are on shore, and are turned over on their backs, they cannot regain the natural position. Large interspaces between the extremities of the ribs, and portions of the sternum always remain cartilaginous, so that the carapace is far lighter than in the tortoises. The head is large and globose, and cannot be retracted within the shell; it is covered above with symmetrical horny shields, and the jaws are armed with sharp, horny sheaths. Turtles are marine animals; their pinnate feet and light shell render them excellent swimmers. They sometimes live at a great distance from land, to which they periodically return to deposit their soft-shelled eggs (from 100 to 250 in number) in the sand. They are found in all the inter-tropical seas,



TURTLE.

and sometimes travel into the temperate zones. The flesh and eggs of all the species are edible, though the Indian turtles are less valuable in this respect than those of the Atlantic. The most highly valued of the family is the green turtle (*Chelonia viridis*), from which turtle soup is made. It attains a large size, sometimes from six to seven feet long, with a weight of from 700 to 800 pounds. The popular name has no reference to the color of the carapace,



SKELETON OF TURTLE.

which is dark olive, passing into dingy white, but the green fat so highly prized by epicures. The edible turtle of the East Indies (*C. virgata*) is also highly prized; but, according to Tennent, at certain seasons they "are avoided as poisonous, and some lamentable instances are recorded of death which was ascribed to their use."

The hawk's-bill turtle (*C. imbricata*), which yields tortoiseshell, is also prized; but the flesh of the loggerhead turtle and of the leather-back is of little value.

In printing, the segment plate in which a form is locked up in a type-revolving machine. The column-rules are wider at the top than at the bottom, to hold the type firmly, and are secured by screws. The edge of the side stick has a series of beveled projections, and is pressed against the form by a piece having similarly beveled projections and worked by a screw.

**Turtle Dove,** in ornithology, *Turtur communis,* widely distributed in the warmer parts of Europe. It is a beautiful bird, of somewhat slender form, a summer visitant to the cooler latitudes, arriving in May and departing in September. The male is about a foot long, with the head light bluish gray, the back grayish-brown, the scapulars and small wing coverts black, with broad rust-red margins, the breast pale grayish-purple, the neck with two large black spots barred with white. The female is rather smaller, with similar plumage, but of duller tints. They feed on grain and vegetables, often frequenting fields of beans and peas. They make a slight, flat nest of a few twigs, in which two glossy, creamy-white eggs are deposited about the middle of May, and the parent birds take turns at incubation, sometimes rearing two broods in a season. The note is a soft, mournful "coo," often uttered when the bird is on the ground. From its habit of pairing for life, and its fidelity to its mate, the turtle dove has long been a symbol of conjugal affection.

In Scripture, probably either *T. communis* or *T. risorius.* The latter bird is about 10 inches in length; tail short; general color gray, tinged with red, upper parts greenish brown, with a black collar on the back of the neck.

**Tuscaloosa,** a city and county-seat of Tuscaloosa co., Ala.; on the Black Warrior river, and on the Alabama and Chattanooga railroad; 55 miles S. W. of Birmingham. It contains a court house, a lunatic asylum, the Alabama Central Female College (Bapt.), the University of Alabama, the Tuscaloosa Female College (M. E.), the Stillman Institute for Colored Students (Pres.), several libraries, National banks, and a number of daily, weekly, and monthly periodicals. It has large cotton and coal interests, and an assessed property valuation exceeding $1,500,000. Pop. (1890) 4,215; (1900) 5,094; (1910) 8,407.

**Tuscan Order,** a style of architecture which originated in the N. of Italy, on the first revival of the arts in the free cities, and beyond which it has never yet traveled, except in some examples which were introduced by Inigo Jones in the first Church of St. Paul, Covent Garden, and by Sir Christopher Wren in porticoes at St. Paul's Cathedral. It is a simpler variety of the Doric, with unfluted columns and without triglyphs.

**Tuscan Shrew,** in zoölogy, *Crocidura etrusca,* the smallest living mammal, measuring from the snout to the tip of the tail rather less than three inches. Fur ashy-red above, light ash-colored beneath, tail clothed with short hairs, with rings of longer white hairs; ears moderate, projecting from the fur. Found in the extreme S. of Europe, from France to the Black Sea, and in the N. of Africa.

**Tuscany,** formerly a grand-duchy, now a province of Italy; area, 9,304 square miles; pop. (Jan. 1, 1906) 2,651,468. The Northern Apennines forms a considerable portion of its N. boundary, the sea being its boundary on the W. The principal river is the Arno. Cereals cover a large area, and vineyards, olive yards, and orchards are numerous. The manufacture of silk is considerable. The marble of Tuscany, especially that of Siena, is well known. Tuscany corresponds to the ancient Etruria, which was, however, of wider extent. After the fall of the Western Empire (476) it passed successively into the hands of the Ostrogoths, Byzantine Greeks, and Lombards. Charlemagne made it a Frankish province, and it was governed by marquises or dukes till the 12th and 13th centuries, when it became broken up into a number of small republics, four of which were Florence, Pisa, Siena, and Lucca. From the first Florence occupied the leading place, and it gradually extended its territory. In 1569 Pope Pius I. granted to Cosmo I. the title of Grand-Duke of Tuscany, and this position was retained, with interruptions, by the Medici family till 1737, when it passed to Francis Stephen, Duke of Lorraine. In 1859, when under his descendant, the Grand-Duke Leopold, it was annexed to Sardinia by a popular vote, and in 1861 became, with Sardinia, part of the kingdom of Italy.

**Tuscarawas River,** a river of Northeastern Ohio, which uniting with the Mohican river at Coshocton, forms the Muskingum. It is about 125 miles long. The chief town on this river is Massillon.

**Tuscarora,** a tribe of North American Indians, who at an early day lived on the Neuse river in North Carolina. They had much trouble with the colonists and were nearly destroyed as a tribe. The remnant united with the Iroquois and settled in the Oneida territory in New York. They number about 380, and live on the Indian reservation in New York State.

**Tusci,** the name given by the Romans to the ancient inhabitants of Etruria or

Tuscany, and the people existing when Rome was founded, and till Etruria became a portion of the Roman empire.

**Tusculum,** anciently a city of Latium; about 15 miles S. of Rome; on a ridge of hills known as the Colles Tusculani, and forming part of the Alban range. Octavius Mamilius, ruler of Tusculum, married a daughter of Tarquinius Superbus, and played a conspicuous part in the last of the great struggles made by the banished tyrant to regain his kingdom. But the Latins were so thoroughly beaten at Lake Regillus (496 B. C.) that they were glad to enter into an alliance with the victor, and ever after, except in the Great Latin War (340–338 B. C.), remained steady in their fidelity to Rome. As early as 378 B. C. the inhabitants of Tusculum received the Roman franchise. Toward the close of the Republic Tusculum became a favorite country residence of the wealthy Romans; Lucullus, Cato, Brutus, Hortensius, Crassus, Cæsar, and Cicero had villas here. Till 1191 Tusculum continued entire; but it was stormed then by the Romans and ruined forever. Many fine remains of ancient Tusculum have been dug up, the most remarkable being the amphitheater, theater, and city walls.

**Tuskegee Institute,** a coeducational non-sectarian institution in Tuskegee, Ala., for colored students; opened in 1881; has endowment funds exceeding $1,375,000; grounds and buildings valued at over $1,110,000; volumes in the library, about 25,000; average number of faculty, 167; average student attendance, 1,500; graduates, over 1,200.

**Tussaud, Madame,** the foundress of the well-known exhibition of wax-work in London; born (Marie Grosholtz) in Berne, Switzerland, in 1760; learned the art of modeling in wax in Paris. For a time she was engaged in giving lessons in modelling to Elizabeth, sister of Louis XVI., and in this way became acquainted with the leading personages at court. Imprisoned for three months during the Revolution, in 1802 she established herself in London. The collection of over 300 portrait figures (that of Voltaire and others still on view modelled by Madame Tussaud herself from life), with the "Chamber of Horrors," devoted to figures of murderers, instruments of torture, the guillotine of the Revolution, etc., is one of the sights of London. She died in London, April 16, 1850.

**Tusser, Tussore,** or **Tusseh,** the silk spun by the tusser silkworm. The centers of the traffic are in Bengal, the Central Provinces, Berar, and the Nizam's country. There are generally two crops of the insect during the year. The cocoons are purchased in May and June by the rearers from those who have collected them from the jungle; the female cocoons are the larger. They are almost perfectly smooth, of a gray color, with darker veins across the outer surface. When mature, the largest are about two inches long by one and a quarter broad, those of average size about an inch and a half long. The inner layer of the fiber is quite loose, forming a soft cushion for the insect within. The silk, when obtained has a glossy or vitreous look. It is now manufactured in Europe as well as in India, being largely used for cloaks and mantles designed for winter wear. No kind of silk so closely imitates sealskin or is so durable. It is used in the manufacture of Utrecht velvet, and has the rigidity requisite to render it a valuable material for carpets.

**Tusser, Thomas,** an English musician, teacher, and poet; best known as the author of "Five Hundred Pointes of Good Husbandry"; born in Rivenhall, Essex, England, about 1515. From his rhyming autobiography it would appear that he served as a chorister first at Wallingford Chapel, and afterward at St. Paul's; had the honor of being flogged if not instructed by Nicholas Udall at Eton; was attached for a number of years to the court, probably in the capacity of a musician; and at a later date kept a farm for some time in Suffolk. The "Five Hundred Points" were first published in 1573, having been preceded by "A Hundred Good Points," which had seen at least five editions since its appearance in 1557. In rude rustic rhymes, which have hardly a claim even to the name of verse, he inculcated a good amount of sound agricultural wisdom; and the book is still of interest for the glimpses it affords of the country life of the times, as well as for occasional passages of quaint and vigorous expression. The best editions are Dr. Mavor's (1812), Arber's (1870), and the English Dialect Society's (1878). He died in London about 1580.

**Tusser Silkworm,** in entomology, the *Antherea mylitta,* a common Indian silkworm, which yields a rather coarse-looking, but very durable silk. It is wild throughout the low hills of the central table-land of India, being absent from the Himalaya Mountains and from the alluvial plains. It feeds on many shrubs and trees.

**Tussilagineæ,** in botany, a tribe of *Tubuliflorœ.* Leaves alternate, all radial. broad; outer flowers female, very slender, and tubular or ligulate; florets of the disk tubular, usually bisexual; anther cells not tailed; arms of the style connate, pubescent, with bifid, conical tips.

**Tussilago,** a genus of *Compositæ* consisting of a single species, *T. farfara,* a very common British plant on damp heavy soil, and called popularly the "coltsfoot," from the shape of its leaf. Its heads of bright-yellow flowers appear in March and April,

succeeded by fruits bearing a soft snow-white pappus. The leaves, which develop subsequently, are broadly cordate and angu-

TUSSILAGO FARFARA.

lar, cobwebby above and densely cottony beneath. It is dispersed through Europe, Asia, and North Africa. The name is derived from the Latin tussis, and the leaves are still used as a cough remedy, more especially for asthma. The web from the leaves makes a good tinder. *Petasites vulgaris*, or butterbur, was formerly included in this genus. Its leaves, in shape and size like those of the garden rhubarb, render it a conspicuous plant by river sides in many parts of Great Britain.

TUSSOCK GRASS.

**Tussock Grass** (*Dactylis cæspitosa*), a large grass, same genus with the cock's-foot grass of the United States, native of the Falkland Islands, Fuegia, and South Patagonia. It grows in great tufts or tussocks sometimes five or six feet in height, the long tapering leaves hanging over in graceful curves. The plant is a useful food for cattle, and several attempts have been made to establish it for that purpose.

**Tussock Moth,** the *Dasychira pudibunda*, a grayish-white moth about an inch long, the caterpillars of which do great mischief in hop grounds, and are known as hop dogs. The caterpillar is delicate green in color, with brush-like tufts of yellow hairs on several of the segments. It feeds on leaves throughout the summer, becomes a hairy chrysalis about September, and emerges as a moth in the following spring. A hard syringing is recommended if the caterpillars are present in large numbers.

TUSSOCK MOTH AND CATERPILLAR.

**Tutenag,** or **Tutenage,** a white alloy, of copper, 50; nickel, 19; and zinc, 31, used for tableware, etc. It resembles Packfong, Chinese white copper, albata, and German silver. The alloy has various names and proportions of the ingredients; a small quantity of lead or iron is added in some formulæ.

**Tuticorin,** a town in Madras, British India; near the S. extremity of the peninsula; 70 miles N. E. of Cape Comorin, and 513 S. W. of Madras. In the roadstead here, where ships ride safely 2½ miles from the shore, is conducted all the sea-borne trade of the district. There is a pearl-fishery in the neighborhood. Tuticorin has acquired increasing importance as the terminus of the South Indian railway. The Prince of Wales disembarked here from Ceylon in 1875, and proceeded N. in the first train that opened the line.

**Tutiorism,** in theology, mitigated rigorism; the doctrine which, while holding that obedience to the law is always the safer and better way, allows that an opinion of the highest intrinsic probability in favor of liberty may sometimes be followed.

**Tutor,** in many universities, the name given to scholars attached to the various colleges, by whom, assisted by private tutors, the education of the students is chiefly conducted. They are selected from the

college. Also in Scotch law, the guardian of a boy or girl in pupilarity. A father is tutor to his children by common law. Failing him, there may be three kinds of tutors — tutors nominate, tutors-at-law, or tutor-dative; the division being borrowed from the Roman law. A tutor-nominate can only be appointed by the father, either under his will or by some writing clearly indicative of his wish. He is not generally bound to find security for his intromission with the estate of his pupil, but the Court of Session may ordain him to do so. A tutor-at-law is appointed by the court when there is no tutor-nominate, or when he dies, or does not accept. The nearest relation by the father is usually appointed if 25 years old and able to give security. But the tutor-at-law has only the custody of the pupil's estate, his person being intrusted to his mother, or, failing her, to his nearest relative on her side. A tutor-dative is named by the crown when there is no tutor-nominate, nor at-law. The office is in all cases an unpaid one, and the tutor is bound to make inventories and to keep accounts. For certain important acts — selling land, for example — he requires the sanction of the Court of Session. In American colleges a tutor is an advanced student who teaches other pupils in branches in which they are deficient.

**Tuttiett, Mary G.,** pseudonym MAXWELL GRAY, an English novelist; born in the Isle of Wight. She wrote: "The Broken Tryst" (1879); "The Silence of Dean Maitland" (1886); "The Reproach of Annesley" (1889); "In the Heart of the Storm" (1891); "Sweethearts and Friends" (1897); "The House of Hidden Treasure" (1898); "The Forest Chapel" (1899); etc.

**Tuttle, Mary McArthur Thompson,** an American author; born Nov. 5, 1849; was graduated at Hillsboro College in 1868, and later at the School of Design, McMickin University. In 1874–1875 she studied literature, art, and foreign languages abroad. She became a painter of landscapes and portraits, and in 1895 began lecturing on "Color" before colleges, schools and literary societies. Her publications include: "Chronological Chart of the Schools of Painting"; "Family Records in Hillsboro"; Crusade Sketches"; etc.

**Tutuila,** an island of the Samoan group, belonging to the United States under the treaty of Dec. 2, 1899, between the United States, Great Britain, and Germany, for details of which see SAMOAN ISLANDS. For several years the United States was anxious to acquire possession of the harbor of Pago Pago, on this island, for a naval and coaling station. In 1872 the local authorities ceded the harbor for this purpose, and in 1878 a treaty was signed in Washington by which the United States was given the right to establish at that harbor a station for coaling, naval supplies, freedom of trade, commercial treatment as a favored nation, and extra-territorial consular jurisdiction. This harbor was occupied by the United States in 1898, with the purpose of utilizing its advantages as a coaling and supply station. Tutuila, the island upon whose coast this harbor is located, has a population of 3,750 and an area of 54 square miles, while Upolu has an area of 340 square miles, and Savaii 659 square miles.

**Tver,** a province of Russia, surrounded by the provinces of Novgorod, Jaroslav, Vladimir, Moscow, Smolensk, and Pskov; area, 24,975 square miles; pop. (1908) 2,098,700. From the Volchonski Forest, a range of thickly wooded limestone hills in the W., offsets running between lakes and swamps intersect almost the whole of Tver. In the Ostashkov district are the headwaters of the Volga, Düna, and Msta. Tver is drained by the Volga and its affluents. The Volga is connected with the Msta by the canal of Vishnij Volotchok, and by the Mologa and the Tichvin canal with the Tichvinka and Sias, which run into Lake Ladoga. There are 100 lakes in Tver, of which the largest are Seliger, Ochvat-Shadenje, and Steresh. One-fourth of the surface is forest. Potatoes and flax are increasingly cultivated. The chief occupations are the cutting and floating of wood, and the preparation of tar, pitch, and turpentine.

**Tver,** a city and capital of the Russian province of the same name, is on both sides of the Volga at its confluence with the Tverza and the Tmaka, 110 miles N. W. of Moscow. It has fine streets and squares, an imperial palace, a cathedral, and 33 churches, several monasteries, a priests' college, a gymnasium, a technical school, a cavalry cadets' school, a teachers' seminary, a ladies' college, several benevolent institutions, and a theater. There are 28 factories. Its position on the St. Petersburg-Moscow railway and on the river Volga gives Tver great transit traffic; which is chiefly in corn and metal wares. Entirely burnt in 1763, Tver was speedily rebuilt by Catharine II., who has here a monument. Pop. (1908) 53,544.

**Twat,** an oasis in the Sahara, S. E. of Morocco, to which it is considered as belonging. The inhabitants are about 300,000 in number, partly Arabs, partly Berbers, and are fanatical Mohammedans.

**Tway Blade,** or **Twy Blade,** in botany, the *Listera ovata,* an orchid, about a foot high, having two ovate, elliptic, opposite leaves, whence its popular name. Flowers distant on the spike, yellowish-green. The allied *L. cordata,* with stems three to five inches high, and a few very small spiked

greenish-brown flowers, is called the lesser tway blade.

**Tweed,** a river of Scotland, which rises in the S. part of Peeblesshire, passes by or near to Peebles, Melrose, Kelso, Coldstream, from near which place it forms the boundary line between England and Scotland for 16 miles, runs through England for a short distance, and then enters the North Sea at Berwick; total length, 97 miles. Its tributaries include the Ettrick, Gala, Leader, Teviot, Eden, and Till. Its waters abound with salmon and trout, and its name is celebrated in connection with some of the best literature of Scotland.

**Tweed, William Marcy,** an American politician; born in New York city, April 3, 1823; began life as a chairmaker; became an alderman; was in Congress in 1853–1855; was chairman of the board of supervisors of New York city in 1856, and school commissioner in 1856–1857. He was twice sent to the State Senate, and in 1870 was appointed commissioner of public works for the city. He had previously been chairman of the general committee of Tammany Hall and grand sachem. As head of the "Tweed Ring," composed of influential and unscrupulous politicians, he succeeded in obtaining control of the funds of the city government and distributed almost unlimited patronage to his friends. He was brought to trial in 1873; convicted on no less than 12 charges of fraud; and was sent to the penitentiary for 12 years. A reversal of his sentence was obtained in 1875, but he was again imprisoned for lack of bail on a series of civil suits. He broke jail and escaped to Spain, but was captured, sent back to New York on a warship, and recommitted to Ludlow street jail, where he died, April 12, 1878.

**Tweed,** a cloth, so called from the name of the river which falls into the sea at Berwick, where it is largely manufactured. It is said, however, that some cloth called on an invoice tweels, or tweeled, that is, woven diagonally, having been sent to London, the word, which was blotted or imperfectly written, was misread Tweed, and as the cloth was manufactured in the valley of the Tweed, and the designation tweed was consequently an appropriate one, it was allowed to stand, even after the error had been detected.

**Tweedledum,** a word used only in the phrase, the distinction between tweedledum and tweedledee. The suggestion is that the only difference between the two is in sound — a distinction without a difference. The expression arose in the 18th century, when there was a dispute between the admirers of Bononcini and those of Handel, as to the respective merits of those musicians. Among the first were the Duke of Marlborough and most of the nobility; among the latter the Prince of Wales, Pope, and Arbuthnot.

> "Some say, compared to Bononcini,
> That Mynheer Handel's but a ninny;
> Others aver that he to Handel
> Is scarcely fit to hold a candle.
> Strange all this difference should be
> 'Twixt tweedledum and tweedledee."
>
> —J. Byrom.

**Twelfth Day,** the twelfth day after Christmas, on which is held the festival of Epiphany. On the evening of this day, called Twelfth night, various social rites and ceremonies are observed in different countries. One of these is the baking of a twelfth cake, into which a bean is introduced. When the cake is divided at the feast the person who receives the piece containing the bean is made king for the occasion.

**Twelve Apostles, The.** See APOSTLES' ISLANDS.

**Twelve Patriarchs, Testaments of the,** a work of the 2d century after Christ, in which, on the model of Jacob's blessing of the tribes in Genesis xlix., discourses and prophecies of Christ are put into the mouths of the fathers of Israel.

**Twelve-wired Bird of Paradise,** the *Seleucides alba,* from New Guinea. Its general plumage appears at first sight to be velvety black, but on closer examination it is found that every part of it glows with the most exquisite metallic tints — rich bronze, intense violet, and, on the edges of the breast feathers, brilliant green. An immense tuft of dense plumes of a fine orange-buff color, springs from each side of the body, and six of these on each side terminate in a black curled shaft.

**Twelve Tables,** the name given to the earliest code of Roman law, civil, criminal, and religious, made by the decemvirs in 451–449 B. C. These, originally comprised in 10 tables, to which next year two others were added, were supposed to form the basis of all Roman law, and in Cicero's time were still committed to heart by boys at school. But they were very far from being a complete system. The occasion for them arose in the constant complaints made by plebeians of oppression by patricians; and the principal aim of the tables was to define rights, fix penalties, and prevent oppression under legal forms. Some of them were based on Greek models; most of them were derived from earlier Roman legislation. Many older laws were left intact by them, and reappear in Justinian's code. To the original tables commentaries were from time to time added.

**Twenty-plume Moth,** the *Alucita polydactyla,* a small European moth. Wing expanse about half an inch; wings cleft into many distinct plumes. It deposits its eggs at the end of May on the undeveloped flower buds of the honeysuckle. The caterpillar

entering the buds feeds on the stamens and pistils in June and July. The perfect insect is found in August and September, and, then hibernating, reappears in spring, occasionally entering dwelling houses.

**Twilight,** in astronomy, the faint diffused light which appears a little before sunrise, and again for some time after sunset, the amount and duration of the light varying materially in different latitudes and at different seasons. Popularly, the term is only applied to the evening twilight, the morning twilight being called dawn. Twilight is produced by the diffused reflection of light from and among the atmosphere after the direct rays of the sun have ceased to reach the earth. When the sun descends below the horizon, its rays pass through the atmospheric strata, and some of them are reflected toward the earth and illuminate its surface. At first the light, falling on the lowest and densest strata, is reflected in great abundance, but as the sun descends to a greater distance below the horizon, the rays fall on higher, and therefore rarer, atmospheric strata. Consequently fewer rays undergo reflection, and as the number of reflected rays diminishes as the sun descends, the strength of the twilight diminishes in the same proportion, till at last the solar rays fall on strata so rare as to be incapable of reflecting light, and the twilight accordingly disappears. In the morning the change from darkness to light takes place in a similar manner, but in inverted order.

**Twill,** a diagonal appearance given to a fabric by causing the weft threads to pass over one warp-thread, and then under two, and so on; instead of taking the warp threads in regular succession, one down and one up. The next weft thread takes a set oblique to the former, throwing up one of the two deposed by the preceding. The fabrics thus woven are very numerous — satin, blanket, merino, bombazine, kerseymere, etc. When the threads cross each alternately, in regular order, it is called plain weaving; but in twill, the same thread of weft is flushed, or separated from the warp, while passing over a number of warp threads, and then passes under a warp thread. Twills are used for the display of color, for strength, variety, thickness, or durability.

**Twin Screw,** a propeller of a steam vessel, composed of two separate and parallel screws which revolve in opposite directions, thus giving increased power over a single screw propeller. The twin-screw system is now employed in the principal warships of the world, and triple-screws are used on the commerce destroyers "Columbia" and "Minneapolis," of the United States navy.

**Twin-spot Carpet,** in entomology, a European geometer moth, *Larentia didymata,* The fore wings brown, with four irregular, transverse waved pale-gray bars, with a double dark spot (whence the name) between the third and fourth bars. The caterpillar feeds on *Anthriscus sylvestris.*

**Twin-spotted Quaker,** a European night moth, the *Tæniocampa munda.* The wings are gray, with two closely approximate and very conspicuous dark spots on the disk of the fore wings. The caterpillar feeds on the oak.

**Twin-spotted Wainscot,** a European night moth, the *Nonagria geminipuncta.* The fore wings are dingy olive-brown, the hind wings brown. On the former a small double spot, white, dark brown, or white surrounded by dark brown. The caterpillar lives in the hollow of the common reed, *Arundo phragmites.*

**Twin Valve,** a form of valve attached to the discharge outlet of a pump. It is used for making a double connection, one with the steam boiler, for supplying it with water, and the other with a line of hose, for use in case of fire, or for conducting water wherever desired.

**Twiss, Sir Travers,** an English jurist; born in London, England, March 19, 1809; was educated at University College, Oxford. Successively fellow and tutor of his college, a public examiner at Oxford, Professor of Political Economy at Oxford (1842–1847), and of International Law in King's College, London (1852–1855), he became in 1855 Professor of Civil Law at Oxford. In 1858 he became Chancellor of the Diocese of London, in 1862 advocate-general of the Admiralty, Queen's advocate-general in 1867, being knighted that same year. He served also on various royal commissions. He resigned all his officees in 1872, but in 1884 drew up for the Belgian King Leopold II. a constitution for the Kongo Free State, and in 1885 acted as legal adviser to the West African Conference at Berlin. Among his most important writings are "View of the Progress of Political Economy since the 16th Century" (1847); "Lectures on International Law" (1856); "The Law of Nations" (1861); "Law of Nations in Times of War" (1863); "Monumenta Juridica: The Black Book of the Admiralty" (4 vols. 1871–1876), an edition for the Rolls series of the "England's Laws and Customs" of Henry de Bracton (6 vols. 1878–1883), and "Belligerent Right on the High Seas" (1884). He died in London, Jan. 15, 1897.

**Two-speed Pulley,** a variable speed arrangement, consisting of two fast pulleys, the shaft of one being tubular and sleeved upon that of the other. One connects by large and small wheels to the lower shaft, and the other by small and large wheels, the difference in communicated speed being very

apparent, and the belt being shifted from the loose pulley to one or the other of the fast pulleys as may be required.

**Two-toed Ant Eater,** the *Cyclothurus didactylus*, one of the two species of the genus *Cyclothurus*, formerly included in *Myrmecophaga*. It is about the size of a common squirrel, arboreal, and lives on insects. On the fore limb the rudiments of the first and fifth digits are hidden beneath the skin, and the second and third digits are furnished with claws; the feet with four claws. From the forests of Costa Rica, Honduras, and Brazil.

**Tyburnia,** a Latinized form of Tyburn, a former suburb of London, now built over, and including Portman and Devonshire Squares and their surrounding streets, to which fashionable district the above popular name has been given.

**Tyburn Ticket,** a ticket granted under an act of Will. III.) to prosecutors who had secured a capital conviction. This ticket exempted the prosecutor "from all manner of parish and ward offices within the parish wherein such felony was committed, which certificate shall be enrolled with the clerk of the peace of the county, on payment of 1s and no more." This act was repealed by one passed June 3, 1818. Tyburn tickets were transferable, and often sold for a high price.

**Tyche,** the Greek goddess of fortune.

**Tycho Brahe.** See BRAHE, TYCHO.

**Tychsen, Olaus Gerhard,** a German Orientalist; born in Tondern, Germany, Dec. 14, 1734. His greatest work is "Leisure Hours at Bützow" (6 vols. 1866–1769), a valuable repertory of Jewish history and erudition. He also wrote: "Elements of Arabic" (1792); "Elements of Syriac" (1793); "Syriac Natural Science" (1795). He died in Rostock, Germany, Dec. 30, 1815.

**Tychsen, Thomas Christian,** a German Orientalist; born in Horsbyll, Silesia, May 8, 1758. He wrote: "Principles of Hebrew Archæology" (1789); "Grammar of Literary Arabic" (1823); and several essays on "Numismatics," "Palæography," "The Poetry of the Arabs," etc. He died Oct. 23, 1834, at Göttingen, where he was Professor of Theology.

**Tydfil.** See MERTHYR-TYDVIL.

**Tye,** in mining, an inclined trough for separating ore by means of a flowing stream of water. The slimes are allowed to flow in a thin wide stream upon the upper part of the trough, then disturbed by a broom, and collected, according to relative weight and quality, at different parts of the length of the trough. The sorts are known as heads, middles, and tails; the first going to pile, the second is retyed, the third is refuse. Nautically a rope by which a yard is hoisted. It passes through the mast; one end is attached to the middle of the yard, and the other end is hooked to a purchase composed of the tye-block and fly-block, by which the hoisting is effected.

**Tyle Berry,** the *Jatropha multifida;* an American shrub cultivated in Indian gardens, where it is known as the coral plant, the flowers having a considerable resemblance to coral.

**Tyler,** a city and county-seat of Smith co., Tex.; on the St. Louis Southwestern, and the Interior and Great Northern railroads; 19 miles N. W. of Trout. It contains a court house, public library, the Charnwood Institute, numerous churches, the Cotton-belt Hospital, several National banks, and a number of daily, weekly, and monthly periodicals. It has fruit-tree nurseries, canning factories, cotton compress, iron rolling mills, and tile and pottery works, and an assessed property valuation of over $2,500,000. Pop. (1890) 6,908; (1900) 8,069; (1910) 10,400.

**Tyler, Harry Walter,** an American educator; born in Ipswich, Mass., April 16, 1863; was graduated at the Massachusetts Institute of Technology in 1884; was assistant instructor and full instructor of mathematics there in 1884–1887. He then studied abroad. Returning to the United States he was made full Professor of Mathematics at the Institute of Technology in 1893. His publications include "Entertainments in Chemistry" (1886); "The Application of Determinant Theorems to a Particular Case" (1890); "Technological Education in the United States" (1891); "The Educational Work of Francis A. Walker" (1897); etc.

**Tyler, James Gale,** an American artist; born in Oswego, N. Y., Feb. 15, 1855; received a public school education; then studied marine painting with A. Cary Smith. His paintings include "Abandoning the Jeannette"; "The Constitution"; "The Fortunes of War"; "The Raging Main"; "Flying from the Alabama"; "The Flying Dutchman"; "New England on the Lee"; "Heaving Over the Deck Load"; "First American Shipwreck"; "Cloud Burst"; etc.

**Tyler, John,** an American statesman, 10th President of the United States; born in Charles City, Va., March 29, 1790. His father was an officer in the army during the Revolution, and a judge of the Federal Court of Admiralty. Tyler was graduated at William and Mary College, in 1807, when but 17, and was admitted to the bar in 1809. At the age of 21 he was elected to the Virginia legislature; and in 1816, at the age of 26, was elected to Congress. In 1825 he was elected governor of Virginia, and in 1827 Senator of the United States. He sus-

tained the States' Rights policy in Congress, voted against the so-called Force Bill empowering President Jackson to enforce the revenue laws in South Carolina, and for the resolutions censuring Jackson for removing the government funds to State banks. When, in 1836, the Virginia legislature instructed him to vote for the expunging of this censure, he resigned his seat in the Senate. In 1839 he was elected to the Virginia legislature, and in 1840 was elected Vice-President on the Whig ticket with William H. Harrison. On April 4, just one month after entering on the duties of his office, President Harrison died, and Tyler became President by succession. He at once came into conflict with Congress by vetoing financial bills that he believed to be in violation of the Constitution. His Cabinet, except Daniel Webster, resigned, and their places were filled by States' Rights Whigs. The

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most important acts of his administration were a treaty with China and the annexation of Texas (1845). At the expiration of his term he retired to private life, till 1861, when he was made president of a peace convention. Failing in his efforts to effect a compromise, he joined the Confederacy, and served in the Confederate Congress till his death in Richmond, Va., Jan. 18, 1862.

**Tyler, Lyon Gardiner,** an American educator; born in Charles City co., Va., in August, 1853; son of John Tyler, President of the United States; was graduated at the University of Virginia in 1875; practised law in Richmond, Va., in 1882–1888; and in the latter year accepted the presidency of William and Mary College. His publications include "The Letters and Times of the Tylers"; "Parties and Patronage in the United States"; "Cradle of the Republic" (1900); etc.

**Tyler, Moses Coit,** an American historian; born in Griswold, Conn., Aug. 2, 1835; was graduated at Yale University in 1857; later studied theology; ordained in the Congregational Church in 1859; pastor of the First Congregational Church, Poughkeepsie, N. Y., in 1860–1862; Professor of English Literature in Michigan University in 1867–1872 and in 1874–1881; literary editor of the "Christian Union" in 1872–1874. He became Professor of American History in Cornell University in 1881; was ordained deacon in the Protestant Episcopal Church in 1881, and priest two years later. He was author of "History of American Literature During the Colonial Period"; "Glimpses of England"; "The Brannville Papers"; "The Literary History of the American Revolution"; "Life of Patrick Henry"; "Three Men of Letters"; and "Manual of English Literature." He died in Ithaca, N. Y., Dec. 28, 1900.

**Tyler, Robert Ogden,** an American military officer; born in Greene co., N. Y. Dec. 22, 1831; was graduated at the United States Military Academy in 1853; served on frontier duty till the beginning of the Civil War and took part in the Spokane expedition in 1858. Just prior to the outbreak of the Civil War he was a member of an expedition to relieve Fort Sumter, the bombardment of which he witnessed. He was made assistant quartermaster with the rank of captain in May, 1861, and assigned to duty in the defenses of Washington. In August of the same year he reorganized the 4th Connecticut regiment, of which he was commissioned colonel and which became one of the most efficient in the army. He commanded this regiment during the Peninsular Campaign; was promoted Brigadier-General of volunteers in November, 1862. During the action at Fredericksburg he commanded the artillery of the center grand division. In recognition of his bravery in that action he was brevetted major, U. S. A. He distinguished himself in the battles of Chancellorsville, Gettysburg, and Spottsylvania; and was placed in command of the artillery reserve in the Army of the Potomac in November, 1863. During the latter action he repulsed an attack of Ewell's corps. For this "gallant conduct and brilliant success" he and his men were publicly thanked by General Meade. He led a brigade at Cold Harbor and there received a wound which maimed him for life and permanently broke his health. At the close of the war he was brevetted Major-General in both the volunteer and regular armies. He also received a sword from the citizens of Hartford, and was thanked by the Legislature. He died in Boston, Mass., Dec. 1, 1874.

**Tyler, Royall,** an American author; born in Boston, Mass, July 18, 1757. In 1794 he was judge of the Supreme Court of Vermont, and in 1800 its Chief Justice.

He wrote the first American play to be acted by regular comedians: "The Contrast," produced in 1786 at New York. He also wrote "May-Day: A Comedy" (1787); "The Georgia Spec.; or, Land in the Moon" (1797); "The Algerine Captive" (1799); "Moral Tales for American Youths"; "The Yankee in London"; and contributed many sketches, verses, and essays to various journals and magazines. He died in Brattleboro, Vt., Aug. 16, 1826.

**Tyler Insurrection,** a popular revolt in England during the minority of Richard II., headed by Wat Tyler, a soldier who had served in the French wars, and Jack Straw, an Essex peasant. Its immediate occasion was the imposition in 1381 of a poll tax of three groats on every adult, to defray the cost of the disastrous French war; and the first blow struck was the death of a tax gatherer, who had offered an insult to the daughter of a blacksmith in Essex. From Essex the revolt spread over Norfolk, Suffolk, Sussex, and Surrey, but its strength lay in the 100,000 men of Kent, who marched on London, passing quaint rhymes from man to man, and putting to death every lawyer whom they found. The nobles fled, paralyzed with fear, while the artisans of London flung open the gates of the city. Soon the stately palace of John of Gaunt at the Savoy, the new inn of the lawyers at the Temple, and the houses of the foreign ambassadors were in flames, while a band under Tyler himself broke into the Tower and dragged out and put to death Archbishop Sudbury, the Prior of St. John, and the treasurer and chief commissioner in the levy of the hated poll tax. At Mile End, without the city, the young king met the great mass of the peasants, whom he overawed by his fearless demeanor, and induced them to disperse by promising them charters of freedom and amnesty. However, 30,000 remained with Wat Tyler to watch over the fulfilment of the royal pledge, and this body Richard met by chance next morning at Smithfield. In the conference which ensued, William Walworth, the Mayor of London, exasperated at the insolence of Tyler, stabbed him with his dagger, and in the scene of confusion which ensued, the king, with great presence of mind, addressed the populace, led them to Islington, and commanded them to disperse. The death of Tyler paralyzed the people, while it revived the courage of the nobility. The king, in violation of his pledge, led an army of 40,000 men through Kent and Essex, and spread terror by the severity of his executions, while in Norfolk and Suffolk the revolt was stamped out with the most ruthless cruelty.

**Tylophora,** in botany, a genus of *Stapelieæ;* twining herbs or under-shrubs, with opposite membranous leaves. Corolla five-parted; the corona five-leaved; the leaflets simple, fleshy; follicles smooth, tapering toward the apex, compressed, somewhat angular on one side. *T. asthmatica* is an Indian twiner, downy when young, with opposite, petioled; linear leaves, and purplish flowers. The roots, which consist of fleshy fibers from a small head, are acrid, and are used on the Coromandel coast as a substitute for ipecacuanha. Dr. Roxburgh, the botanist, Dr. J. Anderson, and others, have borne high testimony to its utility in this respect. The dried leaves are emetic, diaphoretic, and expectorant. Dymock says that *T. fasciata,* found in various Indian hills, is used as a poison for rats.

**Tylor, Edward Burnett,** an English anthropologist; born in Camberwell, Oct. 2, 1832, and educated at the Friends' School, Grove House, Tottenham. Meeting the ethnologist Henry Christy in Cuba in 1856, he accompanied him on a scientific journey through Mexico, one result of which was his "Anahuac, or Mexico and the Mexicans" (1861). He was appointed keeper of the Oxford University Museum (1883), Reader in Anthropology (1883), and Professor of Anthropology (1895). He was in 1888 Gifford lecturer at Aberdeen, and became president of the Anthropological Society in 1891. His "Researches into the Early History of Mankind" (1865) and "Primitive Culture" (1871) stand first among works of their class, in learning, arrangement, grasp of principles, and breadth of view.

**Tylostoma,** in zoölogy, a genus of *Vampyri;* muzzle short, nose-leaf free in front and on sides; ears large, separate, lower lip with a V-shaped space in front, margined by warts; wing-membrane extending almost to the base of the toes, interfemoral membrane very large, extending beyond the feet. There are two species from Brazil and Surinam. In palæontology, a genus of *Tornatellidæ,* with four species, from the Lower Cretaceous rocks of Portugal. Shell ventricose, smooth or punctate-striate, spire moderate, aperture ovate-lunate; outer lip periodically thickened inside and expanded, rising slightly; under lip callous, spread over body-whorl.

**Tympan, Timpan,** or **Timpane,** in printing, a rectangular frame hinged by one edge to the carriage of a hand printing press, and having stretched across it a piece of cloth or parchment. The blank sheets are laid upon the tympan, in order to be brought down on the form to receive the impression. The blank sheet is fitted on the tympan sheet, which is of the same size as the paper to be printed, and forms a guide for placing it. The blank sheet is held by the frisket. The inner tympan is a smaller frame covered with canvas, and the two tympans hold the blanket between them. Since

the improvements made in printing presses, the name is applied to the outside sheet on the impression cylinder.

**Tympanum,** in anatomy, the drum, middle ear, or middle chamber of the ear; a narrow, irregular cavity in the substance of the temporal bone, placed between the inner end of the external auditory canal and the labyrinth. Its roof is formed by a thin plate of bone, situated on the upper surface of the petrous bone, its floor is a narrow space, its outer wall is formed mainly by a thin semi-transparent membrane — the membrana tympani — which closes the inner end of the external auditory meatus; its inner wall is uneven, its anterior extremity is narrowed by the gradual descent of the roof, and is continued into the Eustachian orifice, and its posterior one has at its upper part a large, and several small openings leading into the mastoid cells. The tympanum receives the atmospheric air from the pharynx through the Eustachian tube, and contains a chain of small bones by means of which the vibrations communicated from without to the membrana tympani are in part conveyed across the cavity to the sentient part of the internal ear. In architecture, (1) the triangular panel of the fastigium or pediment of any building, comprehended between its corona and that of the entablature. (2) The space between the top of a door and the arch inclosing it. (3) The die of a pediment. (4) The panel of a door. In botany, the same as epiphragm. In hydraulic engineering, an ancient form of wheel for elevating water. Its original form was like that of a drum, whence its name. It was a cylinder with radial partitions and small openings in the periphery, which admitted a certain quantity of water into the chambers thus formed as those portions of the periphery came in turn to be submerged. As the wheel revolved, such portions of water were carried up and flowed along the partition toward the axis around which the water was discharged, being elevated to a height nearly equal to the radius of the wheel. The wheel was driven by floats on the periphery or side of the wheel, or by means of animal or manual power, and had several modifications.

In machinery, a kind of hollow tread-wheel wherein two or more persons walk, in order to turn it, and thus gave motion to a machine. In music, a hand-drum or tambourine, but covered with parchment, back and front. It was used in conjunction with various kinds of harps, lyres, and pipes, cymbals of metal, the straight brass trumpet and curved brass horn, the castanets of wood and metal.

**Tyndale, Hector,** an American military officer; born in Philadelphia, Pa., March 24, 1821. He was not opposed to slavery and knew little of the raid of John Brown, but he was requested to escort Mrs. Brown on her last visit to her husband. While in the discharge of this duty he suffered many insults and threats, and on the morning of the execution an unseen assassin fired a shot at him. Prior to the execution a number of papers in the South had threatened that a "nigger's" remains would be substituted for those of Brown and given to his friends. Therefore, when the authorities offered the coffin to Tyndale he positively declined to accept it till it was opened and the body identified. When Fort Sumter was fired on he immediately returned from Europe, where he was visiting, and became major of the 28th Pennsylvania regiment, with which he participated in 24 battles and 19 skirmishes; was promoted lieutenant-colonel in April, 1862. He particularly distinguished himself during the battle of Antietam, when he was in command of a brigade with which he checked three assaults by the Confederates. Though wounded in the hip early in the day he remained on the field till carried to the rear in the afternoon with a musket ball wound in the head. He was promoted Brigadier-General of volunteers in November, 1862, for "conspicuous gallantry, self-possession, and good judgment at Antietam." Later, he accompanied General Hooker on the relief of Chattanooga. During the action at Wauhatchie by a bayonet charge he captured a hill which was later named Tyndale's hill. He also took part in a number of battles around Chattanooga; was brevetted Major-General of volunteers in 1865. He was Republican nominee for mayor of Philadelphia in 1868, and was defeated by only 68 votes out of more than 120,000. He died in Philadelphia, Pa., March 19, 1880.

**Tyndale, William,** memorable in the history of the English Bible; born in Gloucestershire, England, about 1484; was educated first at Oxford — at Magdalen Hall, says unvarying tradition — and graduated B. A. in 1512. His name occurs in Boase and Clark's "Register of the University of Oxford" (1884–1888) as William Hychyns — a name said to have been assumed by his great-grandfather, and by which at any rate, together with Tyndale's he is described in official documents. It is probable enough that at Oxford he may have been influenced by the disciples of Colet, who himself lectured here till 1505, and it is still more probable that he was attracted to Cambridge by the fame of Erasmus, who lived there from about 1510 to 1514. He left Cambridge most probably about the close of 1521 to become chaplain and tutor in the household of Sir John Walsh of Little Sodbury in Gloucestershire. His sympathy with the new learning soon aroused suspicion, and in 1523 he went up to London, where he was hospitably entertained in the house of Hum-

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phry Monmouth. He was already a competent Greek scholar, and in his unsuccessful application to Tunstall, Bishop of London, he carried with him a translation of part of Isocrates as a recommendation.

In the spring of 1524 he went to Hamburg, probably made his way thence to Wittenberg, next in the autumn of 1525 to Cologne, and there, with the help of a Franciscan friar named William Roye, and another, began with Quentel in 1525 the printing of his English New Testament in an impression of 3,000 copies in quarto size. This had not proceeded beyond the Gospels of Matthew and Mark when the officious intrigues of Cochlæus forced Tyndale to flee to Worms, where, instead of completing Quentel's unfinished work, Peter Schoeffer printed for him another impression of 3,000 copies in a small octavo size, without prefaces to the books or annotations in the margin. The quarto was completed soon after, most probably also by Schoeffer, with general introduction, prologues, inner marginal references, and outer marginal glosses, these last largely taken from Luther's version of 1522, the references especially being faithfully copied in many cases even to the errors. The translation itself owed much to Luther, much also to the 3d ed. (1522) of the Greek Testament of Erasmus with its Latin translation.

Tunstall and Warham denounced the book, hundreds of copies were bought up and burned by their authority, but in both forms it made its way by the summer of 1526 to the hearts of Englishmen, and the strong simplicity and homely vigor of its style established a standard of Biblical translation into English, and bequeathed its phrases imperishable to all posterity. By 1530 as many as six editions, of which three were surreptitiously printed at Antwerp, had swiftly and silently been dispersed, yet, says Westcott, so fierce and systematic was the persecution of these six editions, numbering perhaps 15,000 copies, there remains of the first quarto fragment but one copy, and that imperfect (Grenville Library, British Museum; photo-lithographed by Mr. Arber, 1871), of the first octavo but two, one incomplete (in St. Paul's Cathedral Library), the other wanting only the title page (in Baptist College, Bristol; facsimile by Francis Fry, 1862), and of the others but two or three copies, and these not satisfactorily identified.

Meantime Tyndale continued to toil indefatigably at the labor of his life. In 1530 he published at Malborow (Marburg) by Hans Luft his version of the "Pentateuch" (reprinted by Rev. Dr. J. I. Mombert, 1885), where the marginal glosses, almost all original, contain many violent attacks on the Pope and the bishops, full of rich satire, irony, and even humor. It is scarcely possible that Tyndale could have found time to master Hebrew very thoroughly, and we find that here, still more than in his New Testament, he leans heavily on Luther. Later, in 1531, appeared his version of "Jonah," with a prologue (facsimile by Mr. Fry, 1863). An unauthorized revision of Tyndale's New Testament was made at Antwerp by George Joye in August, 1534, and in November of the same year Tyndale himself issued there at the press of Marten Emperowr a revised version with short marginal notes and prologues, together with a translation of the "Epistles taken out of the Old Testament which are read in the church after the Use of Salisbury on certain days of the year." These include a large number of portions from the Old Testament and the Apocrypha. One copy of this work, probably that preserved in the British Museum, was struck off on vellum and beautifully illuminated for presentation to Queen Anne Boleyn, under whose favor apparently was printed in 1536 by T. Godfray a reprint of Tyndale's revised New Testament — the first volume of Holy Scripture printed in England. Once again before the end Tyndale revised his Testament (1535), this time without the marginal notes, but with the innovation of headings to the Gospels and Acts, but not the Epistles. Another point of difference was a peculiarity of orthography (*maester, faether, moether, stoene, moost*, etc., 200 in all), long suspected erroneously to have been an attempt to supply provincial forms for English rustics, but more probably, as Mr. Demaus, Bishop Westcott, and Mr. Ellis believe, due to the copy being read to a Flemish compositor, who gave the Flemish equivalents of the English vowel sounds.

But now it wanted only the crown of martyrdom to consecrate the lifelong devotion of Tyndale to his task. Already the emissaries of Henry VIII. had often tried to get hold of him, or at least to discover his hiding place. He had spent two quiet years of constant labor at Antwerp, part of the time in the house of Thomas Poyntz, when he was seized through the treachery of one Henry Philips, May 24, 1535, "not without the help and procurement of some bishops of this realm" says Hall. For 16 months he lay in the castle of Vilvorde, and it appears that Cromwell made some ineffectual efforts to save him. A single letter in Latin, discovered by M. Galesloot in the archives of the Council of Brabant, is reproduced in facsimile by Mr. Demaus, and gives a touching picture of the noble martyr sitting through the long winter nights in the cold and darkness of his dungeon, and asking above all things for a lamp and his Hebrew Bible, grammar and dictionary. It is highly probable that his prayer was granted, and that before the end he had completed, according to unvarying tradition, the translation of the Old Testament to the end of the

Books of Chronicles. This part of his work was printed by John Rogers, along with Tyndale's Pentateuch and New Testament, in what is usually known as Matthews' Bible. Tyndale's protracted trial was apparently not begun till 1536; on Friday, Oct. 6, of that year he was first strangled, then burned. Foxe tells us that at the stake he cried "Lord open the king of England's eyes!" Eight years before he had written, "If they shall burn me, they shall do none other thing than that I look for . . . There is none other way into the kingdom of life than through persecution and suffering of pain, and of very death, after the ensample of Christ."

Tyndale's chief original works were "A Parable of the Wicked Mammon" (1527); "Obedience of a Christian Man," his most elaborate book (1528); and "Practice of Prelates" (1530), a pungent piece of controversial polemic, called forth by Sir Thomas More's "Dialogue" (1529), which he met formally with his plain and pointed "Answer" (1531). More followed next year with the first part of his long and intemperate "Confutation," a work unworthy of its author's reputation. Tyndale's "Works" were published together with those of his dear friend Frith, and Barnes, in folio by John Daye in 1573. His "Doctrinal Treatises and Introductions to Different Portions of the Holy Scripture" were published by the Parker Society in 1848; his "Expositions and Notes on the Holy Scriptures, together with the Practice of Prelates," in 1849, and the "Answer to More's Dialogue" in 1850. It was fortunate for our literature that the task of translating the Bible fell to a writer with such a splendid sense of English as William Tyndale. He gave to his work an independent and ineffaceable stamp of originality, and, if later revisers of greater learning have amended his renderings, the characteristic language of the English Bible remains his own.

**Tyndall, John,** an English physicist; born in Leighlin Bridge, near Carlow, Ireland, Aug. 21, 1820. He studied in Germany; in 1850 published in the "Philosophical Magazine" "Discoveries in Magnetism." He was elected a Fellow of the Royal Society in 1852; Professor of Natural Philosophy at the Royal Institution in 1853, and in 1867 its superintendent. He was the first to climb the Weisshorn, and subsequently reached the summit of the Matterhorn; and published: "Philosophical Transactions in Glaciers of the Alps" (1860); "Mountaineering in 1861" (1862); and "Hours of Exercise in the Alps" (1871). "Heat Considered as a Mode of Motion" appeared in 1863; "Dust and Disease," 1870. In 1872 he lectured in the United States; the profits he devoted as a fund "in aid of students who devote themselves to original research." Besides the works mentioned, he published: "Sound: A Course of Eight Lectures" (2d ed. 1875); "Faraday as a Discoverer" (1868); "Nine Lectures on Light" (1870); "Essays on the Use and Limit of the Imagination in Science" (1871); "The Forms of Water in Clouds and Rivers, Ice, and Glaciers" (1872); "Essays on the Floating Matter of the Air" (1881); and "New Fragments" (1892); besides many others. He received honorary degrees from the Universities of Cambridge and Edinburgh, and was made D. C. L. by Oxford. He died in Haslemere, Surrey, England, Dec. 4, 1893.

**Tyne,** a river of England, formed by the junction near Hexham of the North Tyne, which rises in the Cheviots, on the borders of Roxburgh, and the South Tyne, which rises at Tynehead Fell, in the extreme E. of Cumberland. The united stream divides the counties of Durham and Northumberland, passes the ports of Newcastle, Jarrow, North and South Shields, and enters the sea at Tynemouth after a course from Hexham of nearly 30 miles. The Tyne has, since 1854, been the subject of large engineering operations, consisting of extensive dredging, the construction of piers at its mouth, the formation of large docks, and the building of a swing bridge at Newcastle. Thus from the sea to Scotswood suspension bridge, a distance of about 10 miles, the river is navigable for large vessels, and the trade on the river, chiefly in coal, has immensely increased.

**Tynemouth,** a municipal and parliamentary borough of England; 9 miles E. of Newcastle, occupies the angle formed by the line of the coast and the Tyne. Edwin, King of Northumbria, is said to have founded here, about 627, a church of wood, wherein his daughter Rosella took the veil. King Oswald rebuilt it of stone about 640, and probably established the monastery, which in the succeeding centuries suffered much from the hands of the Danes. It was refounded in 1090 by Mowbray, Earl of Northumberland. The monastic buildings were dismantled at the dissolution in 1539. The remains of the priory are chiefly those of the church, which was built about 1100 and enlarged about 1220. The chancel, whose E. and S. walls are still standing, is one of the most exquisitely light and graceful specimens of Early English architecture in the country. The Lady Chapel, a chantry of the Percies, was founded toward the close of the 14th century. Tynemouth castle was built about 1296. All that remains of it now is the great gateway of 14th-century date. Tynemouth is a clean, healthy town, with several good streets and terraces A wide road extends to Cullercoats called

the Grand Parade. The sands are nearly a mile long, and the Permian cliffs are very picturesque. Pop. (1901) 51,366.

**Tyner, James Noble,** an American lawyer; born in Brookville, Ind., Jan. 17, 1826; received an academic education; was a member of Congress in 1869–1875: 2d and 1st assistant postmaster-general, and Postmaster-General in 1875–1882; represented the United States at the International Postal Congress in Paris in 1878. He was appointed assistant attorney-general of the United States for the Post Office Department in 1889 and 1897. He died Dec. 5, 1904.

**Tyng, Stephen Higginson,** an American clergyman, long rector of St. George's

| | |
|---|---|
| 1. Egyptian (Hieroglyphic) | 𓂋𓏏𓈖𓐍𓄿𓏺)(𓎛𓂋𓏏𓈖) |
| 2. Egyptian (Hieratic) | ⲥⲛⲟⲩϥ)ⲏⲓⲉⲧⲏⲱ |
| 3. Egyptian (Demotic) | ⲥⲏⲃ ⲁⲛⲟⲩⲣ ⲗⲓⲃⲏⲏⲓⲍ ⲁ |
| 4. Anglo-Saxon | ȝe-hyndon, and eal Pharaonef |
| 5. Arabic | مُنْكِهِ فَرَأَى رَهَجًا قَرِيبًا مِنْهُ فَقَالَ |
| 6 Armenian | Նորա ասաներ, Երդ երգոցդ / |
| 7. Ethiopian | ንጌየ።። ወጦረ፡ የናስ፡ ወተንጥል፡ ብ |
| 8. Burman | ၎ပ ပ၀ɔ∩က ∞ပ ၅ ၀၎ɔ |
| 9. Cyrillic | Іисоуса имѣть льстиж и оуб |
| 10. Estrangelo (Evangelical Syriac) | ܗܠܡܠܝܬܐ ܠܐ ܕܟ |
| 11. Bulgarian | ѫзѣ, я ѵѣгьѕѕѣшє я я ьѧшє |
| 12. Croatian | mpѫ ꙗѕшɔѣѕ ɔѫшо' яmɔ ɔ%я |
| 13 Gothic | ïn ana𐍅aikψgamannne. ei r |
| 14. Greek (Uncial) | THC IOYΔAIAC EN |
| 15. Greek (Minuscule) | τῶν παντοίων ἀγαθῶν, ἅπερ |
| 16. Hebrew (Old) | וַיֹּאמֶר אֱלֹהִים יְהִי־אוֹר וַיְהִי־אוֹר׃ |
| 17. Hebrew (Rabbinic) | סימנים הרחבונים הלכות השכמת |
| 18 Hebrew (Jewish German) | גלייך חום גחט. חלוואח וועדרן ריך |
| 19. Hebrew (Jewish Script) | ב"א ב"ג וועדן בער טוגען ב |
| 20. Cuneiform | 𒐊 𒐉 𒐈 𒐇 𒐆 𒐅 |
| 21. Coptic | Πεnωικ nτερας† mniq |
| 22. Kufic | للسع.سالبه.للروحبر.الرد |
| 23. Nestorian | ܒܫܡܐ ܕܒܪܗ ܘܪܘܚܐ ܩܕܝܫܐ. ܗܘ ܕܐ |
| 24. Palmyrene | 𐡱𐡣𐡣𐡠𐡤𐡥𐡣𐡱𐡥 |
| 25. Pehlevi | ܐ𐭥𐭫𐭩𐭬 𐭠𐭭 𐭫𐭥𐭬 𐭭𐭩 𐭩𐭥 𐭥𐭩 𐭠𐭭𐭫𐭠𐭩 |
| 26. Persian | ۲واز میان دود ملخها به زمین برامدند |
| 27. Phoenician | 𐤏𐤇𐤄𐤌𐤑𐤋𐤊𐤍𐤏 𐤌𐤈𐤌 |
| 28. Runic | ᛁᚨᚾᛉᚠᚾᚦᚨᚾᛁᚾᛏ |
| 29. Russian | Сократъ до тридцати лѣтъ |
| 30. Samaritan | ·ϡ∧ϡϡ ·ϡ∧ϡϡ ·ϡ∧ϡϡ ·ϡ∧ϡϡ |
| 31. Sanskrit | तानुवाच धर्मात्मा मह- |
| 32. Siamese | รัตน์โกสินทร์ ๒๔๕ ๑๑๐ วันที่ |
| 33. Syriac | ܡܢܫܒܐ ܠܐ ܐܝܬ ܒܝܬܗ. ܗܘ ܕ |
| 34. Tibetan | ཁྱིད་ཀྱི་མཚན་ཐམས་ཅད་ནད་མེད་ |
| 35. Turkish | اوستنه نور وبرمك ايجون كوكن رفيعدر |
| 36. Wallachian (Old) | Ломбардіlор, пентрѕ |
| 37. Zend | ꬱꬹꬰꬵꬱꬹꬰꬵ ꬱꬹꬰꬵꬱꬹꬰꬵ ꬱꬹꬰꬵ |

| 38. Chinese | 39. Manchu | 40. Kalmuck | 41. Japanese | |
|---|---|---|---|---|
| | | | Katakana | Hirakana |
| 天地玄黃宇宙洪荒日月盈昃辰宿列張 | ○有來歷。至止畫。 | ᠨᠢᠭᠡᠨ ᠳᠤᠯᠤᠭᠠᠨ ᠬᠤᠪᠢᠶᠠᠨ ᠲᠠᠪᠤᠨ ᠳᠥᠷᠪᠡᠨ ᠲᠡᠩᠭᠡᠷ ᠤᠨ ᠭᠡᠷᠡᠯ ᠤᠨ ᠳᠤᠷᠠᠯ ᠤᠨ ᠵᠢᠷᠭᠤᠭᠠᠨ ᠤᠨ ᠤᠯᠠᠰ ᠤᠨ ᠨᠤᠲᠤᠭ ᠤᠨ ᠵᠠᠰᠠᠭ ᠤᠨ ᠪᠠᠭᠲᠠᠨ ᠤᠨ ᠤᠯᠤᠰ ᠤᠨ ᠵᠠᠰᠠᠭ ᠤᠨ ᠪᠠᠭᠲᠠᠨ ᠤᠨ ᠤᠯᠤᠰ | イロハニホヘトチリヌルヲワカヨタレソツネナラムウヰノオクヤマケフコエテアサキユメミシヱヒモセス | いろはにほへとちりぬるをわかよたれそつねならむうゐのおくやまけふこえてあさきゆめみしゑひもせす |

FORMS OF TYPE.

Church, New York city; born in Newburyport, Mass., March 1, 1800; and was graduated at Harvard University in 1817. For several years he edited the "Episcopal Recorder," the "Protestant Churchman," etc., and he published in book form many volumes; among them: "Lectures on the Law and Gospel" (1832); "Sermons" (1839–1852); "Recollections of England" (1847); "The Israel of God" (1854); "Christ Is All" (1852); "Forty Years' Experience in Sunday-schools" (1860); "The Prayer Book" (1863–1867). He died in Irvington, N. Y., Sept. 4, 1885.

**Type,** a rectangular solid of metal, wood, or other hard material having a raised letter, figure, punctuation mark, or other character on the upper end, which, when inked, is used to make impressions on paper and other smooth surfaces; the term is also used collectively. Types must be all of a uniform height, and perfectly true in their angles, otherwise they could not be locked firmly together to be printed from. Notches are made on one side of the type to assist the compositor in distinguishing the bottom from the top; the groove is a channel made in the bottom of the type to make it stand steadily. From the character of the letters types are known as CAPITALS, small or lower-case letters, *italics*, script, etc. From their size they receive the following names, from brilliant, which, however, is rarely used, to English, the largest used in ordinary book work: Brilliant, diamond, pearl, ruby, nonpareil, minion, brevier, bourgeois, long primer, small pica, pica, English. The different sizes are now, however, named by the "point" system, as 5-point, 5½-point, 6-point, etc.

Types are made by casting (which is now done by machinery), the letter being first cut on the end of a steel punch, and the punch then driven into a piece of copper, which forms the matrix or bottom of the mold intended to produce the letter. A fount or font is a complete assortment of any given kind of type, the number of each letter being in proportion to the frequence of its occurrence in printed matter, thus:

| | | | |
|---|---|---|---|
| a | 9,000 | n | 8,000 |
| b | 2,000 | o | 8,000 |
| c | 4,000 | p | 2,400 |
| d | 5,000 | q | 600 |
| e | 14,000 | r | 7,000 |
| f | 3,000 | s | 8,000 |
| g | 2,000 | t | 10,000 |
| h | 6,000 | u | 4,500 |
| i | 9,000 | v | 1,500 |
| j | 500 | w | 2,500 |
| k | 800 | x | 500 |
| l | 5,000 | y | 2,500 |
| m | 3,000 | z | 300 |

A complete font of type, including Roman and italic, with capitals, figures, points, and signs, consists of 226 different characters.

**Type Metal,** the alloy of lead and antimony used in casting a printer's types, the usual proportions being one part of antimony to three of lead; but a superior and harder kind of type is sometimes made by alloying two parts of lead with one of antimony and one of tin. Both these alloys take a sharp impression from the mold or matrix, owing to their expansion on solidification, and they are hard enough to stand the work of the press, without being brittle or liable to fracture.

**Typesetting Machines.** The unavoidable slowness and consequent expense of setting and distributing types by hand have set inventive minds to work from the beginning of the art of printing in the effort to devise some means of doing the work mechanically. It is only within very recent times, however, that satisfactory results have been obtained. The first effective composing machine was invented by Dr. William Church, of Connecticut, in 1822 and patented in England. This machine cast types and left them in reservoirs, whence they were set by pressing keys arranged something like those of a piano. To avoid the difficulty of distribution the types were melted down after use. Within the next fifty years, 114 patents on type-setting machines were taken out in the United States and Great Britain. Young and Delcambre's Pianotype, invented in 1840, was used to some extent in England and France, and is said to have set types at the rate of 13,000 per hour. The first distributor was patented in England by Etienne Robert Gaudens in 1840, and three years later a similar, though distinct machine was invented by Frederick Rosenberg in the United States. Numerous distributors and setters were brought out within the next ten years, the most important being that invented in 1851 by Christian Sörenson, of Sweden. Sörenson's machine contained many of the features afterward embodied in John Thorne's machine, referred to hereafter.

The first patent for a typesetter issued to an American in this country was that taken out by W. H. Mitchell, of Brooklyn, in 1853, and Mitchell's was incidentally the first typesetter of any real commercial value. In 1857 Timothy Alden invented a machine which had a fair measure of success in the United States, and was at one time used in the offices of the New York "Tribune." Alexander Mackie invented a machine in 1867, which used the principle of controlling mechanism by means of holes punched in a strip or ribbon—the idea employed by Jacquard in his loom and embodied in the Lanston Monotype. Among the other prominent inventors of composing machines about this time were W. H. Houston (1868), Charles Kastenbein (1869), Thomas J. Plunket (1871), Robert Hattersley (1872), and Alexander Fraser (1872). Kastenbein's machines were first used by the London "Times" in 1872, and the paper

was soon altogether set by them. Fraser's machine succeeded very well in Scotland, and more than 10,000 pages of the 1888 edition of the "Encyclopedia Britannica" were set on it.

The "Burr" machine, invented in 1872, was used for some years in the New York "Tribune" office and is still used to some extent both in the United States and in Europe. Its name was changed to the Empire in 1880.

Quite the most extraordinary composing machine ever devised was the Paige Compositor, invented between 1872 and 1892 by James W. Paige, of Rochester, N. Y. It consisted of 18,000 separate parts, 800 shaft bearings, and countless cams and springs. It could set whole words and do practically everything that the imagination can conceive of a typesetting machine doing. The patent drawings occupied 275 pages, and over $2,000,000 were spent in developing it. But it was far too complicated to be commercially successful. All the patents on Paige's machine as well as the machines already manufactured were purchased by the Mergenthaler Linotype Co., which presented one of the machines to Columbia University and another to Cornell University. In 1880 Joseph Thorne, of Connecticut, who had been experimenting since 1869, brought out a cylindrical form distributor and setter which was destined to outgrow all its contemporaries and take its place among the three or four leading composing machines of the day. The Thorne machine contains 90 channels set in the periphery of an upright cylinder. The operator fingers the keys, which push out the types from the lower ends of the channels. Thence they are carried round on a circular raceway to the point where they are brought in line. A second operator takes the type from the line, puts it in the galley, justifies it, and leads it. The distribution is accomplished by a boy, who puts the type, galley by galley, into a holder which feeds it a line at a time into a cylinder superimposed on the type-cylinder, from which it passes into the low cylinder again and is ready for composition. The type is specially nicked and there are combinations of wards at the magazine entrances which insure the falling of the type into the proper compartments. The Thorne machine was purchased by the Unitype Co., of Brooklyn, N. Y., in 1898, and brought out as the Simplex one-man-setter. Its name was subsequently changed to the Unitype, as the many improvements make it in so many respects a different machine from the original.

In 1884, John F. MacMillan, of Ilion, N.Y., brought out a machine which is also widely used at the present time. It is really two separate machines, a setter and a distributor. The magazines of the setter

Typesetting Machines

are removable and are replaced as soon as empty. The types are ejected from the magazines by the pressure of keys, and are set up in long lines, whence they are justified by hand. The distributor consists of a horizontal wheel with radial channels, surrounded by a frame with corresponding radial channels which connect with the movable magazines. The types are nicked to fit wards in the frame, and when the wheel is revolved slowly they pass into their proper compartments. Both the MacMillan and the Unitype machines compose previously cast type. But the two other great makes of type-setting machines also cast the type as it is required. These are the Lanston Monotype and the Mergenthaler Linotype.

The Linotype was invented by Ottmar Mergenthaler in 1884, and takes its name from the fact that it casts a solid line of types. The molds or matrices are small pieces of sheet metal, each having a letter impressed on its edge. These matrices are placed in magazine tubes, arranged vertically in a continuous line and in alphabetical order, from which they are released by pressure of a key into an inclined channel. They slide down this channel to an inclined traveling belt, which carries them to the assembler, where they are placed in line. They are then spaced out mechanically by duplex wedges, and carried to a mold wheel, where they are cast into solid metal bars known as "slugs." When the slugs have been printed from they are remelted. The Linotype is the most widely used of present-day printing machines; but it is being closely followed by the Lanston Monotype. The two machines have certain features in common, but they are radically different.

The Monotype is constructed on the principle embodied in the Jacquard loom, and in Alexander Mackie's Pickpocket composing machine. A keyboard operates a series of punches, which punch holes in a moving strip or ribbon of paper that is unwound from one spool to another like the ribbon of a typewriter. This ribbon is fed to the casting machine and controls its operations. The machine casts each letter, point, and sign separately, and even casts the spaces. It sets the cast type in column width. Many other machines have appeared in recent years which attracted more or less attention, but gained little, if any, success.

A machine called the monoline has had a great success in Canada and Germany; but it is barred from the United States, as many of its features infringe on the patent rights of the Mergenthaler Linotype Co. In 1894 Frank B. Converse, Jr., of Louisville, Ky., brought out a machine which had some success and was put on the market in 1902, with a number of improvements as the New Converse. Alexander Dow, of New York, invented a good machine in 1896, but

it has never come into vogue. The most unique composer designed since the Paige miracle was the Cox machine, which attracted much attention in 1897. Its most peculiar feature was a method of justifying mechanically. The spaces were crimped or corrugated and were made of lead. The line was overset in length and squeezed down to measure by compressing the corrugations. Somehow it didn't work very well. It was purchased by the Unitype Co.

The most important machine invented abroad in recent years is the Calendoli, named after its inventor, a French priest. In this machine short types are used, grooved so as to slide on rails. The keyboard is extremely complicated, and contains numerous ingenious combinations to enable the operator to strike whole words or syllables at a single motion. A somewhat original machine, called the Pulsometer, was brought out in England in 1904. It is manufactured by the Pulsometer Engineering Co. of Reading. Many experiments have been made in Typebar and Impression machines, but none of them have as yet met with any success. Most of the typesetting in the United States is done by Linotype, Monotype, Unitype, and McMillan machines.

**Typewriter,** a machine fitted with types which print by a pressure on the keys with the fingers. The principle, briefly stated, is that of a series of rods pivoted to keyed rods, similar to the action of a pianoforte, the ends of the rods carrying the characters of the alphabet and all striking on a common center. There is a self-inking arrangement, and several minor improvements have been added in recent years, bringing the invention to a high state of perfection. It is on record that one Henry Mill obtained a patent in England, Jan. 7, 1714, for such a machine. The record does not describe it, except that it was a device to write in printed characters one letter at a time, one after another. Strange as it may seem, there does not appear to have been another effort made for more than 100 years, for the next record found is that of the "Typographer," the first typewriter invented in the United States, patented by William A. Burt, of Detroit, Mich., in 1829. After this came the English patent of 1841 to Alexander Bain and Thomas Wright, entitled, "A Machine to Print Intelligence at Distant Places." It was designed simply for what is now called the printing telegraph. All printing telegraphs are really nothing more nor less than typewriting machines, and that machine had many of the devices and characteristics of the typewriter. It was not, however, a successful machine, and never came into use. The next record is that of the United States patent to Charles Thurber, of Worcester, Mass., in 1843. Thurber's machine was slow and tedious. The next is that of the patent to Fairbanks, in 1848. It consists of several series or systems of vertical converging rods, the rods of each system adapted to be pushed up vertically, like piston rods, against a common impinging point. On the upper end of each rod was the desired type. The machine was designed for printing colors on cloth, but it really belongs to the typewriting art, and is now properly classed therewith. It, however, was impracticable, and was never used. The next is that of the French patent to M. Pierre Foucault, a blind man in the Paris Institute for the Blind, in 1849. This machine printed embossed letters to be read by the blind. The machine proved a success. Several of them were made and were sent to and used in the blind institutions of Europe. It was exhibited at the World's Fair in London, in 1851, and commanded much attention. The next is the patent of Oliver T. Eddy, of Baltimore, in 1850. No model of this invention can be found. No machine of the kind ever came before the public. In 1852 there was another patent issued; in 1854 another; in 1856 three others, one being to A. Ely Beach, of the "Scientific American," and one to Dr. Samuel W. Francis, of New York, Oct. 27, 1857. After that several other patents were issued in 1858, 1859, 1860, and so on up to 1865 or 1866; but none of these inventions proved to be of much practical value. The writing machine called the typewriter was invented at Milwaukee, Wis., in 1867, by C. Latham Sholes, Samuel W. Soulé, and Carlos Glidden. One device after another was conceived and developed till 25 or 30 experimental instruments were made, each succeeding one a little different from and a little better than the one preceding. They were put into the hands of stenographers—practical persons who were presumed to know better than any one else what would be needed and satisfactory. In this way the invention grew till, at the beginning of 1873, the device was thought complete. The use of the typewriter has completely revolutionized the copyist's trade, and the useful little instrument is one of the most valuable labor-saving devices of the day. The principal typewriters in use in the United States are the Oliver, Remington, Smith Premier, Hall, Hammond, Yost, Columbia, Crandall, National, Barlock, Densmore, Williams, Jewett, Caligraph, Blickensderfer, Underwood, and Elliott Fisher for writing in ledgers.

**Typhaceæ,** in botany, typhads or bulrushes; an order of endogens, alliance Arales; herbaceous plants growing in marshes or ditches. Rootstock creeping, stem without nodes, leaves rigid, ensiform, with parallel veins, spathe none. Flowers in cylindrical spikes or heads, monœcious,

the males uppermost; sepals reduced to three or more scales, or even to a bundle of hairs; corolla none. Males: Stamens three or six; filaments long, sometimes monadelphous. Females: Styles short; stigmas simple; ovary one rarely two-celled; fruit dry, indehiscent, one-celled, one-seeded, made angular by mutual pressure, They are found chiefly in the Northern Hemisphere and the temperate parts. Known genera two, *Typha* and *Sparganium*, species 13 (Lindley), 12 (Sir J. Hooker).

**Typhine,** in medical practice, a term proposed by Dr. William Farr for the special zymotic principle by which he considered typhus fever was propagated.

**Typhis,** in zoölogy, a genus of *Muricidæ*, with nine species, from the Mediterranean, West Africa, Cape, India, and Western America, to a depth of 50 fathoms. Shell like Murex, but with tubular spines between the varices, of which the last is open, and occupied by the excurrent canal. Fossil species eight, from the Eocene onward.

**Typhline,** a curious lizard belonging to a family in which the eyes and ears are hidden under the skin. In the typical species, the common typhline (or blind acontias — *Typhlina Cuvierii*), the limbs are entirely wanting, and the animal looks utterly helpless, having no apparent legs, feet, eyes, or ears. It is a native of South Africa.

**Typhlitis,** in pathology, inflammation of the cæcum, with pain and tenderness in the right iliac fossa, constipation, sometimes going on to perforation, producing perityphlitis.

**Typhlonus,** in ichthyology, a genus of *Ophidiidæ*. Head large, compressed, most of the bones cartilaginous; eye not visible externally; scales thin, small, deciduous; villiform teeth in jaws, on vomer and palatine bones. A deep-sea fish, of which only two specimens are known, from a depth of more than 2,000 fathoms in the Western Pacific.

**Typhlophthalmes,** in zoölogy, an old group of *Scincidæ*, with two genera, *Dibamus* and *Typhline*. They are now more generally ranged under *Typhlopidæ*.

**Typhlopidæ,** or **Typhlopsidæ,** in zoology, blind burrowing snakes; a family of innocuous snakes, in some classifications elevated to a sub-order, with two groups, *Catodontes* (having teeth only in the lower jaw) and *Epanodontes* (with teeth only in the upper jaw). There are four genera, with 70 species, distributed in tropical and sub-tropical regions. Body long, cylindrical, vermiform, and rigid; vestiges of hind-limbs present in the shape of rod-like bones; eyes present, but small, and covered by the more or less transparent ocular and preocular shields; scales smooth, imbricated alike on back and belly. This family contains forms which are most remote from the true *Ophidian* type, and which, in older classifications, formed the group *Typhlophthalmes*. They live under ground, their rigid body and short curved tail being adapted for burrowing. After rain they occasionally appear above ground, and then they are very agile in their serpentine movements. The eye, which is scarcely visible in many species, can give to them only a vague and indistinct perception of light. They are oviparous, and feed on worms and small insects. The tongue is forked, and, as in other snakes, frequently exserted.

**Typhlops,** the typical genus of *Typhlopidæ*, with over 60 species, having approximately the range of the family. Body long, slender, and cylindrical; head depressed, rounded; tail short, rounded at the extremity, and armed with a spine; scales small.

**Typhoid Bacilli.** The discovery of a method of identifying the bacillus, or living germ, of typhoid fever is due to Dr. Hiss, one of the bacteriologists of the New York Board of Health in 1897. Previously there were only two ways of determining a case of typhoid fever. The first method was by the physical symptoms of the patients, a clinic study of his conditions. This was always unsatisfactory because till the disease is 8 or 10 days old, these symptoms are not to be depended on. Rose spots, which are a good test, are frequently absent in cases of actual typhoid and other symptoms which are called characteristic may mean malaria or something of the sort, and in the mean time delay in proper treatment may mean death. Another test, devised by Widal, a scientist of Vienna, and said to be actually discovered by Robert Pfeiffer, of Berlin, Dr. Koch's assistant, is an examination of the blood. A drop of blood or serum is taken from the ear lobe or the finger tip, and mixed with pure typhoid culture. A bit of the mixture is then put under a miscopic slide. If there is typhoid in the blood, or if the patient has had typhoid in his system at any time within five years, the bacilli introduced from the typhoid culture, as can be seen plainly through the lens, gather into groups. If there is no typhoid at all, the bacilli move about violently. Yet this test, though good to confirm, is not altogether conclusive and never absolutely proves the actual presence of typhoid. It may simply indicate a past condition and can never be made to be exact. The medical profession has sought some way to find in a patient the specific bacillus of typhoid fever just as it does of diphtheria or tuberculosis. Typhoid germs are to be found only in the intestines, if found at all, but there is another microbe (the colon

bacillus), which haunts the same region and which closely resembles the typhoid bacillus, but is absolutely harmless. If therefore in the matter thrown off from a patient's digestive tract, either species is found, it is very difficult to tell whether it is of the baleful or the innocent sort.

What Dr. Hiss has done has been to devise a culture medium in which typhoid germs will multiply and the colon bacillus will not. The culture is composed of gelatine, agar (which is a Japanese isinglass much in favor with bacteriologists), glucose (to make the mixture ferment), salt, and Liebig's food. Typhoid germs grow in it, and the colon bacillus does not. In actual practice a minute quantity of the semifluid matter sent for examination is taken off on a "loop" and is placed in a little vial containing this "culture." Eighteen hours is sufficient time for the bacilli to grow, and a statement of results will reach the doctor inside of 36 hours after he has sent a specimen to a laboratory. At the end of 18 hours a small portion of the culture is spread on a glass plate which has a glass cover. In a short time, to a practised eye, the appearance of this plate will give the information sought, that is, it shows if there has been any growth. If there is growth, it is a case of typhoid; if not, probably no typhoid exists. See BACTERIA.

**Typhoid Fever,** in pathology, a kind of continued fever which is known by many names. It was called "typhoid" and "abdominal typhus" from its supposed resemblance to typhus or jail fever. It is often known as "low fever" and "slow fever," from its duration; and as "autumnal" or "fall" fever, from the time of the year at which it is most prevalent. The term "enteric fever" was applied to it from the fact that the intestines are always attacked in this disorder; but "gastric fever" is a misnomer, for there is never any organic disease of the stomach. Typhoid fever results from the introduction of a specific poison into the system, and is said to be due to the development of a specific bacillus. It is not contagious, and the poison appears to be communicable only from the discharges. The diffusion of the disease is generally due to the excrement of some patient finding its way into the drains, and thence into wells, or into streams or rivers, the water of which is used for drinking purposes. Hence it is of the highest importance that the excreta of patients suffering from typhoid should be thoroughly disinfected, and, if possible, buried at some distance from any dwelling house; but as in large towns this latter precaution is impossible, disinfectants must be liberally used. In places where the supply of water is from wells, all drinking water should be boiled, and it is a wise precaution during an epidemic to have the milk scalded, as the prevalence of typhoid in London in 1873 was clearly traced to the contamination of the milk by the excreta of a man who had died of typhoid on a milk farm. The period of incubation usually extends over two weeks, being preceded by loss of appetite, languor, headache, dizziness, and bleeding from the nose in many cases.

From the 10th to the 12th day the rash usually appears. It is very slight, and, unless care is taken, may be entirely overlooked. The spots are rose-colored, about the size of a pin's head, disappearing on pressure, but reappearing as soon as the pressure is removed. The patient suffers from debility and diarrhœa, and there is dullness over the region of the spleen, which is enlarged. The stools are of a pea-soup color, and the special lesion observed is enlargement of and deposit in Peyer's glands and the minute solitary glands of the smaller, and sometimes of the large intestine. Sometimes the mental condition is irritable, with illusions and hallucinations, and patients speak in a loud voice and gesticulate wildly. In the third week the symptoms continue with undiminished vigor, and sometimes increase in intensity, with stupor to such a degree that great difficulty is experienced in rousing the patient. In favorable cases, in the fourth week there is a change for the better; the temperature falls, the symptoms are alleviated, the sleep becomes more natural, the motions firmer and less frequent, and the appetite slowly returns. After the 30th day, in the majority of cases, no more spots appear, the fever is at an end, and the patient passes slowly into a stage of convalescence. In typhoid fever relapses are common, and dangerous complications, especially of the lungs, may ensue. If the ulceration of the intestines proceeds so far that they are perforated, death almost invariably follows, and in all cases the mortality is high. The main chance of recovery depends on careful nursing, under the direction of a skilled medical man. The chief treatment consists in reducing the temperature, usually by cold baths or sponging. The fever produces intense thirst, and plenty of fluid should be given. From the ulcerated state of the bowels, solid food must be strictly avoided, beef tea, mutton broth, arrowroot, milk, and eggs being the best forms of nourishment. Stimulants are rarely needed in the early stages of the disease, but may be used with advantage, under medical direction, if the heart's action is weak and the pulse intermittent. See TYPHUS.

**Typhon,** in Greek mythology, a famous giant who was reputed to be the son of Tartarus and Terra, and fabled to have 100 heads shaped like those of a serpent, and with devouring flames darting from its many mouths and eyes. Typhon, as soon

as born, to avenge the death of his brother giants, made war on heaven, compelling the gods to disguise themselves and fly for safety; Jupiter, however, regaining courage, threw off the resemblance of a ram which he had assumed, and, hurling his thunderbolts at the audacious invader, flung him to earth wounded and writhing, when, to prevent his recovery, he cast Mount Etna at his head, and buried the rest of his body beneath the island. Through this vast mountain, however, the imprisoned giant still belches forth his fire and smoke, and howls his discordant thunder. In the Egyptian mythology, Typhon is the name given to the Evil Genius.

**Typhonium,** in botany, a genus of *Dracunculeæ*, closely akin to Arum, but with a single erect ovule in the ovary, and a more sharply pointed spadix. The very acrid roots of *T. orixense*, a native of Eastern Asia, are used in India as poultices.

**Typhoon** ("hot wind"), the name given to the violent hurricanes which rage on the coasts of Japan and China and the neighboring archipelago. They occur from May to November, but especially in July, August, and September, traveling generally from E. N. E. to W. S. W. along the coast of China. In their broad characteristics they resemble hurricanes in other parts of the word, and their tremendous fury is no doubt due very much to the surface conditions under which they are produced.

**Typhus,** in pathology, typhus fever; a contagious fever, which occurs mainly in temperate and cold climates, and often rages as an epidemic. It is also known as "spotted," "epidemic," or "contagious" fever, and was formerly called "camp" or "gaol" fever from its prevalence in camps and prisons. It is most prevalent among females and young people, but the highest rate of mortality from the disease occurs among adult males. The contagion is communicated through the air, and probably proceeds from the breath, which has a peculiar foul smell. It is not communicated from the clothes or excreta, and consequently, by properly isolating the patient, the spread of the fever may be prevented. The period of incubation is supposed to range from a few hours to several days.

The earliest symptoms are heaviness and listlessness, with a confusion of ideas, which afterward develops into delirium; an eruption of round, dark, reddish-brown spots then makes its appearance, the temperature is high, the pulse very rapid, and the patient suffers from extreme weakness. The condition of the bowels varies in different patients, for there may be either diarrhœa or constipation. The duration of an uncomplicated case of typhus varies from 12 to 21 days. The greatest danger is usually during the second week of the illness, death seldom ensuing before the seventh day. The treatment of typhus consists in placing the patient under the best possible hygienic conditions, keeping up the strength with beef tea, mutton broth, eggs, arrowroot, etc., and in alleviating the most prominent and distressing symptoms, such as relieving thirst, by the free administration of cooling drinks, controlling sleeplessness, headache, and delirium by small doses of opium, keeping the bowels open by mild laxatives, etc. Stimulants should not be given to children, and many adults do well without them, but alcohol may be advantageously used in the case of old persons, or where the patient has been accustomed to the free use of stimulants. When recovery takes place, it is generally very rapid, a great change in the condition of the patient often occurring in 24 or 48 hours. The only complication at all common is a form of pneumonia.

**Typographical Union,** a society of compositors banded together for mutual protection, for the regulation of wages, fixing the number of apprentices allowed to each establishment, the length of time each apprentice must serve in order to become a master workman, and for extending general aid to the members of such association.

With the extension of the printing business in the United States, and especially with the development of newspapers, there arose a necessity for mutual protective associations among compositors and other cognate trades connected with the art of printing. These associations were at first local in their jurisdiction. But the migratory habits of journeymen printers suggested the necessity for an organization that would secure for these nomads the comity and extension of favor and protection which the members of a common craft should always receive from each other. From this necessity arose the International Union, which is composed of delegates from subordinate unions in the United States and Canada. While the International Union is the supreme body, the management of the internal affairs of each union is left almost entirely to the subordinate divisions. Thus each local union may regulate the number of apprentices, the scale of wages for composition, time work, etc. Whenever a member of one local union comes within the jurisdiction of another local body, he at once is subject to the bylaws of the latter. Traveling cards are granted to members, but these cards must be deposited with the local union within the jurisdiction of which its holder proposes to remain for a given length of time, and dues must be paid into the local union with which the card is deposited. There are numerous local unions in the United States, that of New York city being the largest, having a membership of several

thousand — followed by Chicago, Philadelphia, Boston, St. Louis, and other large cities of the country. The International Union meets once every year, at different places in the United States or Canada, while the local unions usually hold a meeting each month to transact regular business.

**Typology,** a discourse on types, especially those of Scripture; the doctrine of types; a department of theology which investigates Scripture types, and the principles applicable to their interpretation. It starts from the position that the leading truths of revealed religion were the same under the Patriarchal, the Jewish, and the Christian dispensations. These truths were, however, revealed to the earlier worshipers more or less obscurely, being expressed by symbols, instead of stated directly in words. Each type employed had a twofold meaning and purpose — it was a symbol of some religious truth and predictive of the antitype, Christ.

**Typothetæ,** the name given to a trade guild consisting of persons connected with the printing trades, both workmen and employers. The name as now used in the United States is a revival of an ancient appellation conferred on an association of printers of whom we find record as early as the latter half of the 15th century. In the year 1465, according to Meersman, the Emperor Frederick III. of Germany "permitted printers to wear gold and silver, and both the typographi and typothetæ were honored by him with the privilege of bearing coat-of-arms, and wearing armor. The shield of the typothetæ bore an eagle with extended claws, and the open helmet was surmounted by a crown." The first use of the name in the United States was in 1863, when P. C. Baker, of New York city, proposed the name for a society of employing printers in that city. The name was adopted, but the society did not survive long. In 1883 the New York society was resuscitated, and the name readopted. From that city similar organizations spread all over the country. The Typothetæ is a society which has taken a stand in direct opposition to the domination of trade unionism, and claims as its cardinal principle "the right to regulate one's own affairs, without let or hindrance from outsiders." It has local and international organizations, and is benevolent and fraternal in some of its aspects.

**Tyr,** in Scandinavian mythology, the son of Odin, and the god of war and of fame, which idea is expressed in old Norse by the word *tyr*. According to the Edda, he was single-handed. When the Asa-gods persuaded the wolf Fenrir to allow himself to be bound with the bandage Gleipnir, Tyr put his right hand in the wolf's mouth, as a pledge that he would be loosened; and when the gods refused to release him, the wolf bit off Tyr's hand to the wrist, which was called, in consequence, *Ulflithr*, or the Wolf's Joint. In the twilight battle of the gods, he meets his death at the same time with his enemy, the monster dog Garmr.

**Tyrannus,** a genus of insessorial birds. The best-known species is the tyrant flycatcher (*T. carolinensis*), which is remarkable for its bold and pugnacious disposition. It is a native of the United States, feeds on insects, and is not afraid to attack birds of prey much larger than itself. It is also called tyrant shrike and kingbird.

**Tyrant,** originally, one who obtained supreme or absolute power by usurpation, or who derived it from one who had obtained such power by usurpation, and maintained it by force, though he might exercise his power with strict moderation. Specifically, a monarch, or other ruler or governor, who takes advantage of his power to oppress his subjects or fellow citizens; one who exercises unlawful authority, or legal authority in an unlawful manner; one who acts toward those who are subordinate to him, in a manner which law and humanity do not authorize, or which the purposes of government or policy do not require; a despot; a cruel task master; an oppressor.

**Tyrant Birds,** the *Tyrannidæ*, a family of passerine birds, chiefly confined to tropical regions. Among the 350 species of which the family consists, there is great diversity of form and even of habit. Noteworthy species are the scissor tail (*Milvulus forficatus*), remarkable for its grace of form and beauty of plumage, and the common American shrike-billed kingbird or bee martin (*Tyrannus tyrannus*). The latter, like all the tyrant birds, is of a pugnacious temper, and is a determined enemy to sparrow hawks and other small birds of prey; but it is much disliked by farmers on account of its propensity for eating bees.

**Tyre,** in ancient geography, a famous city of antiquity, on the coast of Phœnicia, 24 miles to the S. of Sidon. The first city of Tyre was built on the mainland, but the second and more important city was erected on an island about a mile long, running parallel with the shore, but separated from it by a strait of the Mediterranean a mile wide. The city covered the whole island, and was of extraordinary magnificence and beauty, while its wealth made it the envy of all surrounding nations. Tyre had two capacious harbors, and the whole island was surrounded by a strong wall 150 feet in height. It was the emporium of all the commerce of the then known world, and the fleets of its merchant princes traded to all parts of the earth. The Tyrians were celebrated for their splendid dyes, especially of scarlet and purple, for their skill in all

mechanical arts, their metallic work, industry, and commerce. In the time of David and Solomon, the Tyrian king, Hiram, maintained friendly relations with the Israelites, and his people, as the importers and chief workmen of Solomon, greatly assisted that monarch in the building of his temple.

Tyre is repeatedly mentioned in the Old Testament for its strength, wealth, and beauty, and is threatened with destruction for its pride and grandeur. It was frequently subjected to the horrors of war, endured many long and fearful sieges, and became nominally a tributary state to the Assyrians and Persians. Alexander III. took Tyre after a seven months' siege of extraordinary difficulty, during which he constructed a mole connecting the insular city with the mainland, in July, 332 B. C. Tyre was taken from the Saracens by the Crusaders, after a siege of five months and a half, June 20, 1123. Saladin sought in vain to retake it in 1187. The prosperity of Tyre was not finally destroyed till the conquest of Syria by the Turks in 1516. At present it is a poor town, called Sur, or Soor. It occupies the E. side of what was formerly the island, 1 mile long, and ½ mile from the shore, thus enclosing two so-called harbors separated by Alexander's causeway, which is now a broad isthmus. The only real harbor is on the N.; but even this is too shallow to admit any but the smallest class of vessels. It is filled, and the N. coast of the island lined with stone columns, whose size and countless number evince the former magnificence of the famous city.

**Tyree,** an Argyllshire island; one of the Inner Hebrides; 19 miles N. W. of Iona. Having a maximum length and breadth of 14 and 6 miles, and an area of 34 square miles, it is treeless and flat, with a mean elevation of only 20 feet, except in the S., where three hills attain 400 feet. There are a score of fresh-water lakes. Nearly 40 Scandinavian forts dot the shores, and there are also a ruined castle, nine standing stones, etc.

**Tyreeite,** a powder obtained from the pink marble of Tyree, Scotland. It was found by Heddle to be composed of sesquioxide of iron, 38.22; alumina, 8.23; protoxide of iron, 3.16; protoxide of manganese, 0.39; magnesia, 29.94; lime, 2.21; water, 12.47; phosphoric acid, 4.71; silica, 1.02 = 100.35. As pointed out by E. S. Dana, no name should have been given to such a mixture.

**Tyrite,** a mineral occurring in pyramidal crystals, embedded in orthoclase, but implanted on black mica, at localities near Hampemyr, Arendal, Norway; hardness, 6.5; sp. gr., 5.13–5.56; composition: essentially a columbate of yttrium, cerium, and iron. Is referred by most mineralogists to Fergusonite.

**Tyrnau,** a town of Hungary, on the picturesque Waag valley railway, about 30 miles N. E. of Presburg. "Little Rome" it used to be called, and not inappropriately, when it was the place of residence of the Hungarian primates. Its university (1635–1774) was transferred to Pest.

**Tyrol,** a crown-land of the Austrian empire; between Bavaria on the N., Switzerland on the W., Italy on the S., and Salsburg, and Carinthia on the E.; and embracing an area of 10,302 square miles, to which is administratively added Vorarlberg, 1,005 square miles, on the W.; pop. of both (1900) 981,949. The province is traversed from E. to W. by the three chains of the Alps; the central chain (11,000 to 12,500 feet), which is crossed by the road over the Brenner Pass (4,588 feet), the principal line of communication between Italy and Germany, separates the German from the Italian side. The people are noted for their fidelity to the Catholic faith and their devotion to their country, but are somewhat backward in education. The romantic mountain scenery attracts thousands of visitors. The more important valleys are formed by the river Inn (flowing N. to the Danube) and the Adige (going S. to the Adriatic), and their tributaries. Pastoral pursuits furnish the chief occupations, though some grain is grown, and considerable attention is paid to the cultivation of the forests (46 per cent. of the area), of fruit, wine (5,720,000 gallons annually), and silkworms. The mines were formerly of great value, but little is now extracted, except of salt (at Hall), anthracite, and a little iron. Metal industries flourish in German Tyrol, cotton manufactures in Vorarlberg, and silk in Italian Tyrol. The chief town is Innsbruck, with a university (1677; with 700 students); Trent, Roveredo, Brixen, and Bozen are the next towns of consequence. The provincial chamber consists of 68 members, excluding Vorarlberg, which has its own chamber of 20 members.

Tyrol, the ancient Rhætia, was conquered by the Romans under the Emperor Augustus. After the fall of the empire it was occupied by the Boiardi (Bavarians) and Langobardi. During the Middle Ages the most important rulers in Tyrol were the counts of Tyrol and the bishops of Trent and Brixen. In 1363 the counts bequeathed their possessions to the Duke of Austria, and they have formed an appanage of the House of Hapsburg ever since, except during the short period 1806–1814, a period made memorable by the patriotic resistance of Andreas Hofer and his associates to French and Bavarians.

**Tyrolite,** an orthorhombic mineral occurring in radiating groups of thin plates, also massive; hardness, 1.0–2.0; sp. gr.,

3.02–3.098; luster on cleavage faces pearly; color, pale apple and verdigris-green, sometimes inclining to blue; translucent to subtranslucent; sectile. Composition: Arsenic acid, 29.2; protoxide of copper, 50.3; water, 20.5 = 100, with the resulting formula, $5CuO.H_3AsO_4 + 9H_2O$; the analysis, however, showed 13.65 per cent. of carbonate of lime, which Church has lately shown is probably present as an essential constituent, and not as an impurity. If this view be sustained, the formula will need modification.

**Tyrone, Hugh O'Neil, Earl of,** an Irish rebel; born in Ireland, about 1550; was the son of an illegitimate son of Conn O'Neil, the 1st Earl of Tyrone, and was himself in 1587 invested with his grandfather's title and estates. But he soon plunged into intrigues both with the Irish rebels and with Spain against the authority of Elizabeth, and in 1597 assumed the ancient title of "The O'Neil," and began the struggle openly. His success soon spread the flame of insurrection over all Ulster, Connaught, and Leinster. The queen sent over Essex with more than 20,000 men, and at Ballyduich Tyrone met him under truce, and submitted his demands to Elizabeth. Lord Mountjoy soon succeeded Essex, and quickly subdued the most of the country. But at length in 1601 a Spanish force of 5,000 men landed at Kinsale, and 2,000 more at Castlehaven. Mountjoy at once besieged Kinsale, while Tyrone advanced to its relief, but was defeated with heavy loss, and severely wounded. Mountjoy pursued him to the N. and ravaged his country. After Kinsale fell Tyrone made his submission at Mellefont and was reinstated in his earldom. But under James I. he intrigued anew with Spain, and finally in 1607 found it necessary to flee. His lands were confiscated, and he himself died in Rome in 1616.

**Tyrosine,** $C_9H_{11}NO_3$; a crystalline nitrogenous body discovered by Liebig, obtained by decomposing albuminous substances, such as casein, etc., by caustic potash. It forms stellate groups of long slender needles, having a silky luster, soluble in boiling water and in alcohol, insoluble in ether. Tyrosine is often found in the urine during acute atrophy of the liver.

**Tyrotoxicon,** a poisonous ptomaine found in cheese and milk, discovered by V. C. Vaughan. Poisoning by ice cream and cream puffs is due to this substance.

**Tyrrhenian Sea,** the name given to the part of the Mediterranean Sea adjoining the S. W. coast of Italy, and extending to Corsica, Sardinia, and Sicily.

**Tyrtæus,** an ancient Greek poet, celebrated for his martial strains, flourished about 680 B. C. His birthplace is unknown. He was lame, and blind of one eye. In the war between the Lacedæmonians and Messenians, the former applied to the Athenians for a general; and the latter, it is said, in derision, sent them Tyrtæus. The bard, however, so inspired the Spartans by his warlike songs, that they reduced the Messenians to subjection. He was accordingly treated with great respect, and received the rights of citizenship. Some fragments of his songs are extant.

**Tyrwhitt, Thomas,** an English classical scholar; born in London, England, March 29, 1730. Among his works are: "Observations on Some Passages of Shakespeare" (1766); a celebrated edition of Chaucer (1773); editions of Isæus's "Orphica" and Aristotle's "Poetics"; critical dissertations on Barbius, Euripides, Aristophanes, and Strabo. He was the original editor of "Rowley's Poems," for which he furnished a preface and glossary, and subsequently added an appendix to prove that they were written by Chatterton. He died in London, Aug. 15, 1786.

**Tysonite,** a mineral forming the central portion of certain hexagonal crystals, the exterior of which consists almost entirely of bastnäsite (the hamartite of Nordenskiöld), which has been derived by alteration from tysonite; hardness, 4.5–5; sp. gr. 6.12–6.14; luster somewhat resinous; color pale wax-yellow; streak, nearly white. Analyses yielded, cerium, 40.19; lanthanum and didymium, 30.37; fluorine, 29.44 = 100, which corresponds to the formula, $(Ce, La, Di)_2F_6$. Occurs in felspar at Pike's Peak, Col.

**Tytler, Alexander Fraser, Lord Woodhouselee,** a Scotch historical writer; born in Edinburgh, Scotland, Oct. 15, 1747. He wrote, besides many other works, "Essays on the Principles of Translation" (1791–1813); "The Elements of General History, Ancient and Modern" (1801), which was long an authoritative text-book; "Life of Lord Kames" (1807); and "Life of Petarch" (1810). He died in Edinburgh, Scotland, Jan. 5, 1813.

**Tytler, Patrick Fraser,** a Scotch historian, son of Alexander F.; born in Edinburgh, Aug. 30, 1791. His principal works were: Lives of James Crichton of Cluny, commonly called "The Admirable Crichton" (1819), Sir Thomas Craig of Riccarton (1823), and John Wicklyff (1826); "Scottish Worthies" (1832–1833); "Sir Walter Raleigh" (1833); "An Historical View of the Progress of Discovery on the Northern Coasts of America," etc. (1832); "History of Scotland from 1149 to the Union of the Crowns in 1613" (9 vols. 1828–1843). He died in Great Malvern, England, Dec. 24, 1849.

# U

**U**, the 21st letter and the 5th vowel of the English alphabet. It is one of the three primitive vowels, from which the various vowel sounds in the Aryan languages have been developed. Its true primary sound was that which it still retains in most of the European languages, viz., that of oo in cool, tool, wood, etc., corresponding to the French ou, as in *cour, tour*, etc., the sound being sometimes short and sometimes long. The Anglo Saxon ú (marked with an accent) has commonly become in modern English the diphthong ou or ow, as Anglo Saxon *thú* = thou, *nú* = now, *múth* = mouth, etc. After r, and after the sounds sh and zh, u has generally retained its old long sound, as in rule, truth, etc. In Anglo Saxon *rúm* = room, *brúcan* = brook (v.) the original long sound is retained, though the form is altered. The old short sound of u is still retained in bull, full, pull, put, etc., but as a rule this sound became changed (probably about the middle of the 17th century) to the sound heard in cut, tun, fun, etc., (marked ŭ), a sound then new to English, not being mentioned by any writer before 1653. This sound, which is very similar to that of the unaccented French e, is characteristic of English, and is often given to the vowels a, e, when unaccented, as is cavalry, camel, etc. It is also given to the vowel o, even when accented, as in money, come, honey, among, etc. A modified form of it often occurs before r, as in bur, cur, fur, etc., and sometimes rr, as in knurr, purr, etc (marked ŭ). This sound is sometimes given to a, i, o, and y before r, as in auricular, her, fir, work, martyr. In the 16th or 17th century arose the practice of using gu to represent a hard g before an e, as in guess, a French practice, borrowed from qu; and to this, and the wish to indicate a long vowel by a final e, must be attributed plague, vague, fatigue, rogue, etc. The final -gue does not, however, always indicate a preceding long vowel; cf. epilogue, synagogue, tongue, etc. The use of u for w in persuade, etc., is modern, also imitated from its use in qu. The long sound of u, as in mute, duke, confuse, etc., (marked ū), and modified by r, as in cure, pure, (marked ü), is not a simple vowel, an i sound being more or less distinctly introduced before it, or fused with it. The corresponding short sound is heard in unit, unity, etc. In some dialects in the United States, this sound is also sometimes given to u after r. Duke is sometimes vulgarly pronounced with the same sound, as dook. The original sound of short u is now only retained in bury, burial, busy, and business. The long sound of u as in mute, is also represented by other combinations, as by -ue, in due, sue, etc; by ew, in dew, flew, etc; and by ui in suit. Ue is used in later spelling as a final u, owing to a rule made by no one knows whom, no one knows why, and no one knows when, that no English word can end in u. In the 13th and 14th centuries ue = French *eu*. Ui has several sounds: (1) ū, as in suit, fruit, etc.; (2) = ĭ, as in build, guild; (3) ī, as in guide; (4) î, as in mosquito; (5) wi, as in anguish, languid. In buoy, buy, buyer, buying, etc., the u is silent, as also in plaguy. In the best period of Roman literature the u sound was expressed by the character v, a character which did not exist in the Anglo Saxon alphabet, its sound, when it occurred between two vowels, being represented by i or occasionally by u. In later times u and v stood indifferently for either sound, the capital being generally written V. In this respect U and V stand to each other as I and J. In almost all English dictionaries, up to a comparatively recent date, words beginning with U and V were combined. In printing, where the sheets are marked by the letters A, B, C, etc. (standing for 1, 2, 3, etc.), the signs J, V, and W, are ignored, so that, for this purpose, the letters of the alphabet are only 23. In respect to its order in the alphabet, its form, and its history in general, U corresponds with the Greek *upsilon*. Greek words containing the diphthong ou, when Latininzed, were spelled with a u; while Greek words with u, when Latinized, were spelled with y.

U as an initial is used for United, as in U. S. United States; U. S. A. United States of America, and United States Army; U.

S. N. United States Navy; U. K.= the United Kingdom; U. P. United Presbyterian (Scotch); U. C. or A. U. C. in dates belonging to Roman history is a contraction for *Ab urbe condita* = from the building of the city (of Rome), as U. C. 400 = in the year of Rome 400.

U as a symbol is used, in chemistry, for uranium.

**Uaupés,** a river in Brazil, the largest tributary of the Rio Negro; length about 700 miles.

**Ubangi,** a river in Kongo Free State; a tributary of the Kongo river, into which it flows. It is about 1,500 miles long.

**Ubbonite,** a follower of Ubbo Phillips, who formed a moderate class among the Anabaptists of the 16th century. Their founder eventually entered the Reformed Church, and died in that communion in 1568.

**Ubeda,** a town of Spain; on a plateau between the Guadalquivir and Guadalimar; 26 miles N. E. of Jaen. It contains a large castle, and manufactures cloth, soap, and leather. A flourishing town under the Moors, it witnessed the victory in 1210 of the kings of Navarre and Castille over Abdallah Mohammed of Morocco. Pop. 19,500.

**Uberti, Fazio** (or **Bonifazio**) **degli** (ö-bār'tē), an Italian poet; born in Pisa, Italy, between 1305 and 1309; was a grandson of Uberti, one of the Florentine leaders of the Ghibelline faction, and was driven into exile by the Guelphs. He wrote an unfinished descriptive poem called "The News of the World," which was quite celebrated, and a poem, "Ditta-Mondo," in imitation of Dante's "Divina Commedia." He died after 1368.

**Ubicini, Jean Henri Abdolonyme,** a French publicist; born in Issoudun, France, Oct. 20, 1818; traveled extensively, and took part in the insurrection of Bucharest in 1848. He wrote: "Memoirs Justifying the Rumanian Revolution" (1849); "The Eastern Question Confronting Europe" (1854); "The Serbs in Turkey" (1865); "Eastern Rumelia Since the Treaty of Berlin" (1880); "Sources of Roman History" (1886). He died in Roche-Corbon, Oct. 8, 1884.

**Ubiety,** in philosophy, the presence of one thing with regard to another; the presence of a thing in place; the state or condition of being in a place. According to the Schoolmen, ubiety might be:

(1) Circumscriptive, as when all the parts of a body are answerable to the parts of space in which it is, and exclude any other body.

"Thou wouldst have led me out of my way if that had been possible — if my ubiety did not so nearly resemble ubiquity, that in Anywhereness and Everywhereness I know where I am, and can never get lost till I get out of Whereness itself into Nowhere." — Southey, "The Doctor," ch. cxcii.

(2) Definitive, as when a human soul is limited in its presence to the same place as a human body.

"Notwithstanding her uncertain tenure of ubiety . . . . she patiently yielded to her lot." — Hudson's "Life of Waterton," p. 92.

(3) Repletive, as when God is present through every portion of space. This last form is sometimes called ubiquity.

**Ubiquarian,** or **Ubiquitarian,** in ecclesiastical history, one of a school of divines, so named from their distinguishing doctrine, that the body of Christ is everywhere, who were the followers of John Brentius, or Brentzen (1499–Sept. 11, 1570), a Lutheran, who first disseminated his views in his "Opinions Concerning Libellous Treatises," published at Tübingen in 1561. James Andreæ, or Andreas, held the same opinion, and Brentius published other works in which it was maintained.

**Ucayali,** a river of Eastern Peru; one of the main affluents of the Amazon, of which it was formerly regarded as the head stream. This honor is now accorded, however, to the Marañon, which, though shorter than the Ucayali, is twice as broad as the latter at their confluence. The Ucayali rises in the mountains of Southern Peru, some of its feeders having their sources only 150 miles from the Pacific on the one hand, and 100 miles from Lake Titicaca on the other. In its upper course it is known as the Apurimac, and below the junction of the Mantara, in lat. 12° S., it is called the Tambo. After receiving the united waters of the Urubamba and Camisea in lat. 9° S., it becomes known as the Ucayali. Its entire course is about 1,500 miles. The Ucayali has been navigated by steamers for a great part of its course, and a steamer has penetrated by the Pachitea, a tributary on its left bank, to within 220 miles of Callao. The Apurimac is not navigable; but with this exception, and that of a fall on the Lower Urubamba, the Ucayali and its principal tributaries are most valuable highways to the heart of a region abounding in vegetable and mineral wealth.

**Uccello, Paolo di Dono,** an Italian painter; born in Florence, Italy, about 1397. He was the first to develop the principles of perspective. His works were principally in fresco, and are numerous in Italian cities. He died in Florence, Dec. 11, 1475.

**Uchard, Mario,** a French author; born in Paris, France, Dec. 28, 1824. Among his dramatic compositions are: "The Husband's Return" (1858); "Second Youth" (1859); "A Burgomaster's Prosperity" (1864);

"The Charmers" (1864). His novels include: "Raymon" (1862); "Gertrude's Marriage" (1862); "Countess Diana" (1864); "A Last Passion" (1866); "My Uncle Barbassou" (1876); "My Cousin Antoinette" (1891). He died in Paris, July 31, 1893.

**Uckewallist,** in Church history, one of a sect who derived their name from Uke Walles, a native of Friesland, who published his opinions in 1637. He taught the doctrine of Universalism, and held that the period of time between the birth of Christ and the descent of the Holy Ghost was one of deep ignorance, during which the Jews were deprived of divine light, and that therefore their sins would not be visited with severity. His followers did not long retain his name as a badge of separation, and became merged in the Mennonites, to whose doctrines their founder strictly adhered.

**Uda, Felice,** an Italian poet; brother of Michele; born in Cagliari, Sardinia, Feb. 25, 1832. He wrote: "Wishes and Hopes" (1852), a volume of verses, and "Memories and Affections" (1862), both of which were received with great favor; also "Literary Sketches" (1863); a series of essays on "Leopardi and Poerio"; "Dante and Modern Poetry"; the comedies "The Heart and the Age" and "Every-Day Saints"; and "Miguel Cervante," a literary study (1873).

**Uda, Michele,** an Italian dramatist; born in Cagliari, Italy, in 1830. At 20 he joined a band of strolling players, and wrote or adapted comedies for them. Among his original compositions are the comedies "The Widow's Suitors," played by Ristori with great success, and "Mask and Face"; and the dramas "In the Coffin" and "The Workingman and His Family." His finest work is the brilliant comedy "The Renegados" (1858). Among his novels are "A Poor Devil," and "From Herod to Pilate."

**Udaipur,** or **Mewar,** a native State of Rajputana, British India; area, 12,753 square miles; pop. (1901) 1,021,664. The capital is Udaipur (sometimes spelt Oodeypore), picturesquely situated on a ridge overlooking a romantic lake, 140 miles S. W. of Ajmere; pop. 45,595.

**Udal,** a term applied to that right in land, which prevailed in Northern Europe before the introduction of the feudal system. Udal tenure still prevails in Orkney and Shetland. This tenure, which was completed by undisturbed possession, provable by witnesses, has been held by the English Court of Session to be the same as allodial.

**Udall, Nicholas,** an English author; born in Hampshire, England, in 1505 or 1506; was educated at Oxford; chose the profession of a schoolmaster; and in 1534 passed M. A. and obtained the post of headmaster of Eton, which he held till 1541, when he was dismissed. He afterward resigned the vicarship of Braintree in Essex, which he had enjoyed along with his mastership; but continued both to teach and preach, and in 1551 was admitted a prebendary of Windsor, and in 1554–1555 appointed headmaster of Westminster school. His comedy of "Ralph Roister Doister," which was probably written for the Eton boys, is a perfectly harmless piece, with a fair amount of vivacity in its execution and ingenuity in its plot, the hero being led into various awkward situations in the course of his suit to Dame Custance, partly by his own stupidity, and partly by the malicious suggestions of Mathew Merrygreek. The play is in rhyme, and has 13 dramatis personæ. Hallam notices that the choice of a city-gallant for "hero" probably determined in some measure the prevalent subject of English comedy all through the Elizabethan age. The exact date of its composition has not been determined; it is quoted in the 3d edition of Sir Thomas Wilson's "Rule of Reason" (1533). There is but one copy of his comedy in existence, having no title page; but it was probably printed in 1566. It is now in the library of Eton College. This is accepted as the first English comedy. Other productions of Udall's pen: "Flowers are for Latin Speakynge" (portions of Terence done into English, 1433), translations of parts of Erasmus's paraphrase of the New Testament, and of Peter Martyr's tract on the Eucharist, and a few Latin letters and poems. He died in Windsor in 1556.

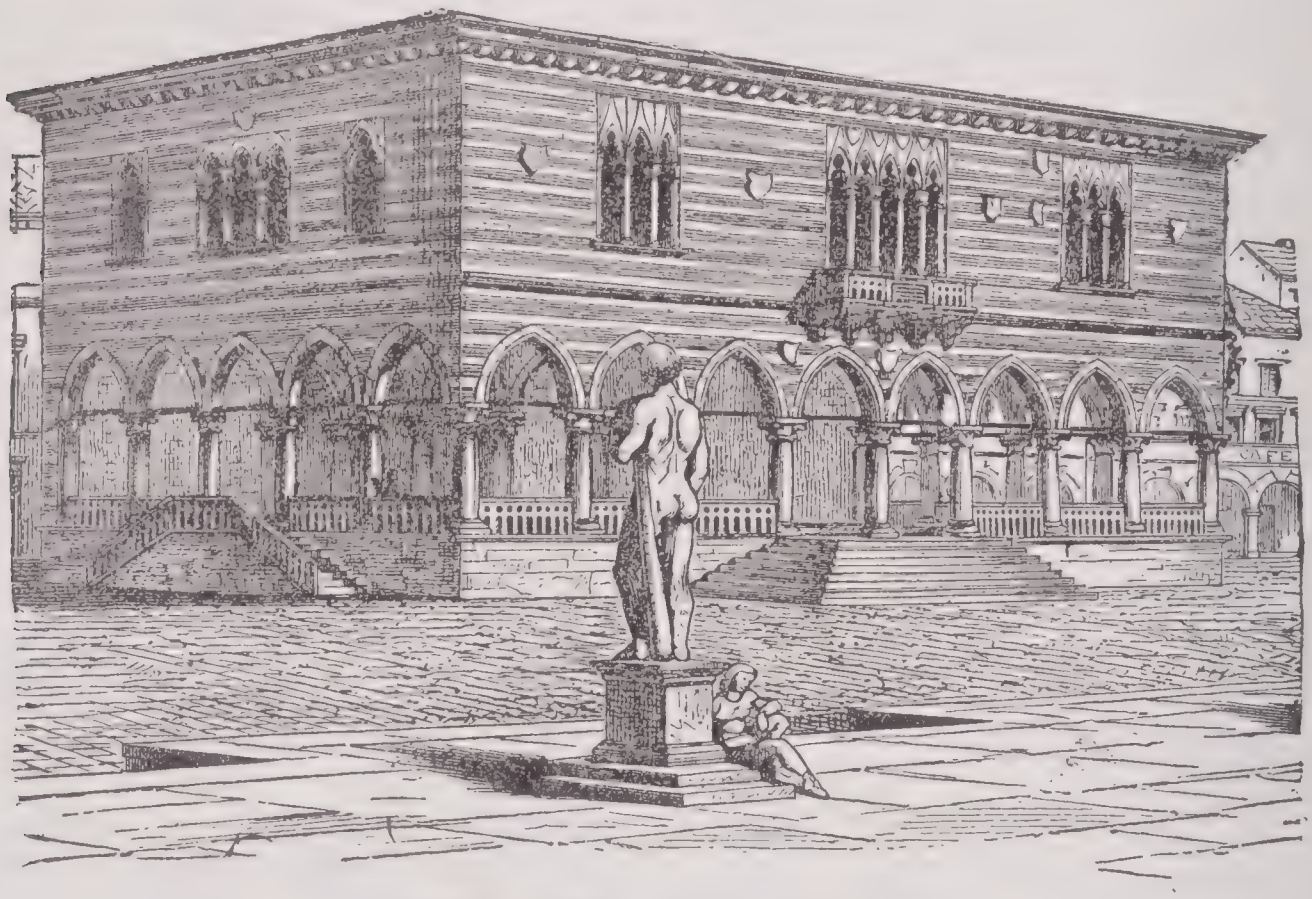
**Udden, John August,** a Swedish-American educator; born in Lekasa, Sweden, March 19, 1859; was taken to Carver, Minn., by his parents in 1861; was graduated at Augustana College, Rock Island, Ill., in 1881; and was an instructor at Bethany College, Lindsborg, Kan., in 1881–1888. In the latter year he became Professor of Natural History and Geology at Augustana College. He was elected a member of the Geological Society of America in 1897. His publications include: "The Mechanical Composition of Wind Deposits" (1898); "The Geology of Muscatine County, Iowa" (1899); "An Old Indian Village" (1900); etc.

**Uddevallite** (after Uddevalla, or Uddewalla, Sweden, where found), a variety of Menaccanite, containing about 10 per cent. of titanium and 70 per cent. of sesquioxide of iron.

**Udine,** a walled town of Italy; capital of a province; in a rich wine country; 85 miles N. E. of Venice. It has wide, hand-

some streets, and contains a Romanesque cathedral, an archbishop's palace, a beautiful campo santo, and, on a hill in the midst of the city, a castle, formerly the residence of the patriarchs of Aquileia. Udine manufactures silk, leather, gloves, hats, etc. Bonaparte resided in the doge's castle at Passariano, close by, during the preliminaries of the peace of Campo-Formio. Pop. (1901) 37,942.

**Udine, Giovanni da,** an Italian painter; born in Udine, Italy, Oct. 27, 1487; studied art in Venice under Giorgione and subsequently settled in Rome. He there assisted Raphael in his work of decorating



UDINE: THE MUNICIPAL PALACE.

the loggie and Sala dei Pontifici in the Vatican. He became especially known for his graceful productions and also because he was the originator of the grotesque decorations in stucco. He afterward painted the standards for Saint Angelo castle and then worked in the sacristy of San Lorenzo. He died in Rome in 1564.

**Ueberweg, Friedrich,** a German philosopher; born in Leichlingen, Rhenish Prussia, Jan. 22, 1826; studied at Göttingen and Berlin; and, after teaching in a school at Elberfeld and lecturing at Bonn University, became in 1862 professor at Königsberg. He is best known by his "System of Logic" (1857; 5th ed. 1882; Eng. trans. 1871) and his "History of Philosophy" (1863–1866; 7th ed. 1886–1888; Eng. trans. 1872), a compendious handbook from an empirical and eclectic standpoint. He gained the Vienna Academy's prize for an essay on the authenticity and order of Plato's works; and an essay on Schiller as historian and philosopher was published posthumously. He died in Königsberg, June 9, 1871.

**Uechtritz, Friedrich,** a German author; born in Görlitz, Germany, Sept. 12, 1800. Among his tragedies are: "Rome and Spartacus," and "Rome and Otto III." (1823); "Alexander and Darius" (1827); "The Sword of Honor"; "Rosamund" (1833). His dramatic poem "The Babylonians in Jerusalem" (1836) is notable for elevation of thought and lyric grandeur. Among his novels are: "Albrecht Holm" (5 vols. 1851–1853); "The Bride's Brothers" (3 vols. 1860); and "Eleazar" (3 vols. 1867), a story of the great Jewish war. He died in Görlitz, Feb. 15, 1875.

**Ufa,** a province of Russia; separated in 1865 from Orenburg; area, 47,112 square miles; pop. (1908) 2,777,700. On the E., where it is bordered by the Southern Urals, the country is mountainous, wooded, provided with excellent pastures, and rich in minerals. It is also well watered by the Bielaya, and has abundance of arable land on which good crops are raised. Ufa, the capital, is on the Bielaya, at the confluence of the Ufa, 735 miles E. by N. of Moscow. It is the see of a bishop, and has considerable manufactures and trade. Pop. (1908) 49,275.

**Uganda,** a British protectorate in East Africa; extending along the N. W. shore of

the Victoria Nyanza, and lying on both sides of the equator; area, 120,000 square miles; pop. about 3,240,000. It was first visited (in 1862) by Speke and Grant, and by Stanley was called the "Pearl of Africa." The country is partly mountainous, partly undulating, partly a plain, very fertile on the whole, and well wooded. The climate is mild and singularly uniform throughout the year, the variation being from 50° to 90° F. The Waganda are a warlike and highly intelligent people speaking a language of the Bantu stock, with well-developed native industries. At the request of King Mtesa, English Protestant missionaries settled here in 1877, and French Catholics followed in 1879. The Christians had much to endure from Mtesa's son, King Mwanga, by whose orders Bishop Hannington was murdered in 1885 on the borders of Uganda, and hundreds of Christians were burned. The presence of Arabs and Mohammedanism further complicated matters, and intestine struggles were not long in breaking out. Dr. Peters tried to extend German influence hither, but the Imperial British East Africa Company regarded Uganda as being within the British sphere under the Anglo-German agreement of 1887, and that it was so settled between England and Germany in 1890. In 1892 a war broke out between sections of the people calling themselves respectively Protestants and Catholics. In 1896 Great Britain bought out the rights of the Imperial British East Africa Company, and Uganda became a British protectorate under a resident commissioner, though Mwanga was left the nominal ruler of Uganda proper. The capital is Mengo, but the British commissioner lives at Port Alice on the Victoria Nyanza. The railway from Mombasa was begun in 1896. A force of trained Sudanese under British officers maintains order.

In February, 1902, the British government announced that it had decided to undertake the development and civilization of the protectorate, and that the region would soon be made perfectly safe for the capital and commerce of all nations. The programme for the development of the country embraced the organization of a military force to be known as "the King's African rifles"; the constitution of a civil administration; the abolition of the remnants of the slave trade; the training of the natives; the cultivation of vegetables, cereals, fruits, and rubber; the protection of the forests; the domestication of useful animals; the search for minerals by modern methods; and the development of a system of irrigation.

**Uggur, Ugar,** or **Ugoor,** in botany, the *Aquilaria agallocha,* a large evergreen tree with alternate, lanceolate, stalked leaves, a top-shaped leathery calyx, downy on the outside, the limbs divided into five segments; reflexed; no petals; 10 woolly scales (sterile stamens); 10 fertile stamens; a two-celled ovary, and each cell with a single suspended ovule, winged on the side. In the interior of old trees are found irregular masses of harder and darker-colored wood, the eagle wood of commerce. A native of Eastern Bengal, Burma, the Malay Peninsula and Archipelago.

In commerce, an oil derived from the above. Wood chips are boiled, and the water thus impregnated is distilled to produce the oil. It is valued as a perfume. Orientals burn it in their temples on account of its fragrance, and Napoleon I. used it for the same reason to illuminate his palace. It has been given in rheumatism.

**Ughelli, Ferdinando,** an Italian historian; born in Florence, Italy, in 1595. He was a Cistercian monk and abbot. His principal work is "Italia Sacra" (9 vols. 1642–1648), an account of all the Episcopal sees of Italy, with lists of the bishops and a great deal of general information regarding the history of Italy. He wrote also "Christian Gaul" (1656). He died in 1670.

**Ugolino, Count of Pisa,** an Italian leader, who deserted his party, the Ghibellines, and with the hope of usurping supreme power in Pisa formed an alliance with Giovanni Visconti, the head of the Guelphic party, who promised to supply him secretly with soldiers from Sardinia. The plot was found out, and both were banished. Giovanni died, but the latter joined the Florentines, and forced the Pisans to restore his territories. In 1284 Genoa made war against Pisa, and Count Ugolino treacherously deserted the Pisans, causing their total overthrow. At length a conspiracy was formed against him, and in 1288 he was cast with his two sons and two grandsons into the tower of Gualandi, where they were all starved to death in 1289. Dante, in his "Inferno," has given the sad tale an undying interest.

**Ugrian,** or **Ugric** (after the name of the Uigurs, a Finnish tribe), a term applied to a Finnic group of Turanian people, comprising the Finns, Lapps, Hungarians, and some other tribes; also to their tongues.

**Ugoni, Camillo** (ö-gō′nē), an Italian historian of literature; born in Brescia, Italy, in 1784; wrote "Italian Literature in the Second Half of the 18th Century" (1856). He died in Brescia, in 1855.

**Uhehe,** an African tribe inhabiting the territory drained by the upper Uranga and the Middle Rueha rivers, and noted for their warlike tendencies. In 1891 they attacked a German expedition commanded by Lieutenant von Zalewski and routed it with

a heavy loss of life. In the following year they destroyed a trading post, established by the Germans at Mpuapua, in Usagara district, 50 miles N. of their habitation.

**Uhl, Edwin Fuller,** an American statesman; born in Rush, N. Y., Aug. 14, 1841; was taken by his parents to Michigan in 1844; was graduated at the University of Michigan in 1862; and admitted to the bar in 1864. He was prosecuting attorney of Washtenaw county in 1871–1872; settled in Grand Rapids in 1876 and practised till he became mayor of that city in 1890. He was made assistant Secretary of State in October, 1893; and during the sickness of Secretary Gresham was Acting Secretary of State. While in this office he was entrusted with the arbitration to settle the boundary between Brazil and the Argentine Republic. He was made ambassador to Germany in February, 1896, and resumed the practice of law in 1897. He died in Grand Rapids, Mich., May 17, 1901.

**Uhlan,** or **Ulan,** one of a variety of light cavalry of Asiatic origin, introduced first into Poland by Tartar colonists. They are employed in the Russian, Austro-Hungarian, and German armies, especially in the latter, for skirmishing, reconnoitering, and scouring the country in advance of the main body of the armies.

**Uhland, Johann Ludwig,** a German poet; born in Tübingen, Germany, April 26, 1787; studied at Tübingen University; practised law in Stuttgart; was elected a member of the Würtemberg Assembly in 1819, and as a politician was ever an advocate of liberal opinions. He was Professor of German Literature at Tübingen in 1829–1832, and latterly lived in studious retirement at Tübingen. His European fame rests on his lyrics and ballads, though he also wrote dramas, etc. He died in Tübingen, Nov. 13, 1862.

**Uhlhorn, Gerhard,** a German theological writer; born in Osnabrück, Germany, Feb. 17, 1826. Among his works are: "The Grounds of Tertullian's Chronology" (1852); "The Basilidian System" (1855); "Christmas Customs and Usages" (1869); "The Struggle of Christianity with Heathenism" (1874);" Catholicism and Protestantism in Face of the Social Problem" (1887); "The Church's Care of the Poor as related to the Present Time" (1892).

**Uhlich, Leberecht,** a German church reformer; born in Cöthen, Germany, Feb. 27, 1799. He founded the independent ecclesiastical organization styled "Free Parishes." Among his writings are: "Christianity and Church" (2d ed. 1846); "The Little Book of the Kingdom of God" (1845); "Thrones in Heaven and on Earth" (1845). He died in Magdeburg, Germany, March 23, 1872.

**Uhrich, Jean Jacques Alexis,** a French military officer; born in Pfalzburg, Lorraine, Feb. 15, 1802; received his education at the Military Academy of St. Cyr, France; participated in the Spanish campaign of 1823, and later was assigned duty in Africa. He was promoted Brigadier-General in 1852 and distinguished himself in the Crimean War, during which he was made general of division. In 1862 he was grand officer of the Legion of Honor. When the Franco-Prussian War began he was in command of Strassburg, which though a strategic point was poorly garrisoned and fortified. The Germans demanded its surrender in August, 1870, which was refused by Uhrich. The Germans thereupon began a bombardment, during which 200,000 balls and shells were hurled into the city. Uhrich stoutly resisted till Sept. 27, when he became convinced that it was impossible to hold the place. In recognition of his gallantry he received the Grand Cross of the Legion of Honor, and was highly complimented by German officers. He published "Documents Relative to the Siege of Strassburg" (1872). He died in Passy, France, Oct. 9, 1886.

**Uigite** (after Uig, Isle of Skye, where found), a name given by Heddle to a mineral occurring with some zeolites in an amygdaloidal rock; hardness, 5.5; sp. gr. 2.284; luster, pearly; color, yellowish-white; composition: Silica, 45.98; alumina, 21.93; lime, 16.15; soda, 4.70; water, 11.25. Dana suggests that as its structure appears to resemble that of prehnite, it needs further investigation.

**Uist, North,** an island of the Outer Hebrides, 17 miles long, and from 3 to 13 miles broad, separated from Harris by the Sound of Harris. The surface is chiefly flat, the coast greatly broken by inlets from the sea, and the principal industry is fishing.

**Uist, South,** separated from the foregoing by the island of Benbecula, is 22 miles in length and 7 miles in breadth. The surface is low-lying in the N., but the remainder is mountainous.

**Uitlanders,** or **Outlanders,** a name given to the foreign residents of the Transvaal Colony. These comprise people from all countries, the majority, however, being British subjects, and the refusal of the Transvaal government to give them the franchise became the source of much trouble. Under treaty arrangements made in 1884, Great Britain had a measure of control over the foreign affairs of the Transvaal (then the South African Republic), but it was solemnly agreed that in its internal affairs the government of the republic should exercise full and complete independence. The discovery of gold in 1886 drew great numbers of foreigners to the

Transvaal, most of them being mining adventurers. These wanted a share in political affairs, but the Dutch Boers who were at the head of the republic refused to listen to their demands. The Uitlanders were allowed, after a residence of two years, to become naturalized, but they had to wait 12 years more before being allowed to vote. Added to this, it was claimed, their taxes were very heavy, much of the public revenue coming out of the share that the government took of the profits of the gold fields. After 1896 the tax on mining profits was 5 per cent.; on the yield of mining leases 2½ per cent., and there was also a heavy poll tax. The Uitlanders were denied the right of public assemblage and had to procure a permit from the police to hold a meeting. Various methods were employed by these people to induce the British government to interfere in behalf of their alleged rights and so precipitate a war. In 1895 the Jameson raid threatened a disruption of peaceful relations, but the matter was adjusted. At Johannesburg, the largest city of the Transvaal, a mass meeting of the Uitlanders was held on Dec. 24, 1898, to agree on a petition to Queen Victoria praying for protection from the tyranny of the Boer police. Their object was frustrated by the presence of a large number of armed Boers who wrecked the interior of the hall and injured many of the people assembled. Another public meeting called on Jan. 13, following, to protest against these proceedings, was also broken up by the native populace. These events and the lack of any definite plan for settling the difficulties, brought on the Boer-English war. See TRANSVAAL COLONY.

**Ujeski, Corneli,** a Polish poet; born in Galicia in 1823. After completing his studies in his native country, he went to Paris, there devoting himself to the study of ancient and modern literature. Most of his own poetry was inspired by love of his country, whose misfortunes he deplored. Among his works are: "Lamentations of Jeremiah" (1847), considered one of the masterpieces of Polish literature; "The Songs of Solomon" (1840); "Odorless Flowers" (1848); "Marathon," a poem; "A Fearful Night"; etc.; as well as collections of shorter poems.

**Ujfalvy, Karl Eugen von, Mezö-Kövesd,** an Austrian philologist; born in Vienna, Austria, May 16, 1842. He wrote: "French Scientific Expedition to Russia, Siberia, and Turkestan" (6 vols. 1878–1880); "Researches in Biblical Ethnography" (1872); "Anthropological Results of a Visit to Central Asia" (1880); "Parsees and Brahmins" (1887).

**Ujina,** a seaport of Japan; near Hiroshima, in the inland sea of Japan. It is also near the naval station of Kure, which contains the Imperial Naval College. During the war with China in 1894–1895 Ujina was the center of the Japanese naval activity. In the summer of 1894 the naval court was removed to Hiroshima as a safer place to direct warlike movements.

**Ujiji,** a small territory on the N. E. shore of Lake Tanganyika, Central Africa; area, 920 square miles; pop. 36,000. The natives are a fine-looking but drunken and dishonest race. They are good smiths and expert fishers and canoemen. The chief town, Kawele, in lat. 4° 47′ S., is a place of considerable trade. Besides being the terminus of the great caravan route from Zanzibar and the residence of a number of Arab traders, it has a daily market, which is largely attended by natives from all the neighboring tribes on both sides of the lake. On account of its beautiful situation and healthy and pleasant climate. Kawele has been called "the watering place of explorers." At Ujiji, in this district, Stanley found Livingstone, Nov. 10, 1871.

**Ukase,** an edict or order, legislative or administrative, of the Russian government. It has the force of law till annulled by subsequent decisions or orders. A collection of the ukases issued at various times, made by order of the Emperor Nicholas in 1827, and supplemented since, year by year, constitutes the legal code of the Russian empire. An edict or order, generally, issued by some competent authority.

**Ukert, Friedrich August,** a German classical scholar; born in Eutin in Lubeck, Oct. 28, 1780. Among his writings are: "How the Ancients Determined Distances" (1813); "Homer's Geography" (1815); "Geography of the Greeks and Romans" (3 vols. 1816–1846); "Demons, Heroes, and Genii" (1850). He died in Gotha, Germany, May 18, 1851.

**Uladislas,** the name of seven kings of Poland:

ULADISLAS I., duke or king, succeeded his brother, Boleslas, in 1081 or 1082; his reign was troubled with civil and foreign wars; died 1102 or 1103.

ULADISLAS II. succeeded his father, Boleslas III., in 1138 or 1139; he was deposed 1146, and died in exile in 1159.

ULADISLAS III., was elected king 1202, and deposed in 1206 on account of his cruelties; died 1233.

ULADISLAS IV., surnamed Loketek, became master of the kingdom in 1296, was deposed by the states, and Wenceslaus elected in his room, 1300, but was restored on the death of the latter in 1305 or 1306. He sustained a war with the Teutonic knights,

and died 1333. His son, Casimir III, called The Great, succeeded him.

Uladislas V., Grand-Duke of Lithuania, obtained the crown by marrying Hedwiga, daughter of Louis. He was succeeded by the son, Casimir IV.

Uladislas VI., son of Casimir IV., is the same as Ladislas VI., King of Hungary.

Uladislas VII., son of Sigismund; born 1595, and succeeded his father 1632. He had previously sustained a war with the house of Romanoff, and afterward, in 1633–1634, he conquered the Turks and Tartars of the Crimea.

**Ulcer,** a word derived from the Latin, *ulcus,* a "wound." Ulcers may be arranged either according to the constitutional or specific disease from which they are derived, or according to the characters which they present. According to the first system ulcers are spoken of as healthy, inflammatory, strumous, etc.; while according to the second they are named irritable, chronic, sloughing, etc. In this article the former of these arrangements is adopted as being, on the whole, the most satisfactory, though each posesses its own advantages. A common, simple, or healthy ulcer is such as is left after the separation of an accidental slough in a healthy person, and is merely a healthy granulating surface tending to cicatrization. Its edges shelve gently down to the base, and are scarcely harder than the adjacent healthy skin. Their surface near the borders is of a purplish blue tint where the young epidermis modifies the color of the healing granulations and within this the granulations have a deeper hue than those at the center, being most vascular where the cuticle is being chiefly developed. The discharge from such an ulcer is healthy or "laudable" pus. The only treatment required is a little dry lint, if there is much discharge, or the water dressing, if the sore is comparatively dry. When the granulations are too luxuriant they must be touched with nitrate of silver and dressed with dry lint.

Inflammatory ulcers differ less than most kinds from the above described common or healthy ulcers. They commonly arise from some trifling injury, such as a blow or slight abrasion of the skin, which to a healthy person would have done no harm. Their most common seat is on the lower half of the leg or shin. The surface is red and bleeds easily; the discharge is thin and watery; the edges irregular or shreddy, and the surrounding skin shows a red tinge, and is the seat of a hot and aching sensation. This ulcer most commonly occurs in the infirm and old, the ill-fed, and overworked. Hence constitutional treatment, good diet, and complete rest (with elevation of the limb) are here demanded in addition to water dressing or lead lotion applied warm. Senile ulcers usually present very little discharge, exhibit granulations of a rusty red tint, and are surrounded by a dusky red area. Nourishing food, wine, bark, and the mineral acids are here required, and opium in small repeated doses is often serviceable. The local treatment must be of a stimulating nature, and in bad cases Sir J. Paget recommends strapping the leg daily with a mixture of resin ointment and Peruvian balsam spread on strips of lint. Strumous or scrofulous ulcers usually occur as the consequence of scrofulous inflammation in the subcutaneous tissue or lymphatic glands. They most commonly occur in the neck, groins, cheeks, scalp, and the neighborhood of the larger joints. The discharge is thin and of a greenish-yellow tint. These ulcers are seldom very sensitive or painful. The general treatment must be that recommended for constitutional scrofula. Iodine in some form or other is the best local application. A poultice of bruised and warmed sea weed is a very popular remedy; but there is probably nothing so efficacious as tincture of iodine diluted with water till it causes only a slight discomfort, and applied three or four times a day (about 30 drops of the tincture may be added to an ounce of water to begin with).

**Ule, Otto,** a German writer on natural science; born in Frankfort on the Oder, Germany, Jan. 22, 1820. His principal works are: "The Universe" (3 vols. 3d. ed. 1859); "Wonders of the Starry World" (1861); "Popular Natural Science" (1865–1867); "The Earth according to Superficial Phenomena" (1873–1876). He died in Halle, Aug. 6, 1876.

**Uleaborg,** a seaport town of Russian Finland; capital of the province of the same name; on the S. bank of the Ulea, near the head of the Gulf of Bothnia. It was founded in 1605, and the privileges of a port were granted to it in 1715. In 1822 it suffered severely from fire. The harbor has become so shallow that vessels are obliged to unload in the roadstead, 4 miles from the town. In 1854 an English flotilla burned the government property in the place. Pop. (1907) 18,398.

**Ulema,** the collective name (which cannot be used as a singular) of the body of professional theologians and doctors of divinity, and therefore of law, in any Mohammedan country. They form the legal and judicial class, and interpret the Koran and the law derived therefrom; they also constitute whatever there is of the nature of a hierarchy in Islam, and their power and influence have often curbed the irresponsible authority of a despot. There are necessarily ulema in every Mohammedan city,

but the most renowned are the ulema of Constantinople, of Mecca, and of the Azhar university at Cairo. The ulema of Turkey are the best organized, and possess many privileges and immunities. They include (apart from the "softas," who are a species of undergraduates training for the rank of ulema) the "imâms" or readers of the public prayers at the mosques; the "muftis" or doctors of the law, who act partly as barristers, partly as assessors in the courts; and the "kadis" or "mollas," who are the regular magistrates, and are under the authority of two chief-justices, the "kâdi" "asker" of Europe and of Asia; while over them all stands the grand mufti or "Skeykh-el-Islâm," the spiritual head (under the Caliph) of orthodox Mohammedanism and supreme judge of the Ottoman empire. The verdicts or decisions of the ulema are called "fetvas." The ulema form the ultra-conservative party in all Mohammedan countries; their interpretations of the Koran, when honest, are rigidly and pedantically in accordance with established tradition, but as individuals they are far from incorruptible. To them is due the lifeless formalism that prevails in Mohammedan countries, and they are the prime movers in all outbreaks of fanaticism.

**Ule Tree,** in botany, the *Castilloa elastica* and *C. markhamiana,* which yield caoutchouc. They are Mexican trees, having male and female flowers alternating on the same branch, the latter consisting of numerous ovaries in a single cup.

**Ulex,** in botany, furze, whin, or gorse; a genus of *Cytiseæ.* Very thorny shrubs, with leaves trifoliolate when young, simple when old. Flowers yellow; axillary calyx two-partite, with a small scale or bractea on each side of the base; the segments nearly entire, or the upper one with two, the lower with three, teeth; standard scarcely longer than the calyx, bifid; keel erect, blunt; legume scarcely longer than the calyx, turgid, few-seeded. Known species 12, from the W. and the S. of Europe, and Northern Africa.

**Ulexite** (after G. L. Ulex, who first correctly analyzed it), a mineral occurring in roundish masses or nodules, consisting of delicate fibers or capillary crystals; found at various localities, but notably in Peru and Tarapaca, South America, associated with various other species, and also in Nova Scotia in massive gypsum; hardness, 1.0; sp. gr. 1.65; luster, when first broken, silky; color, white. Composition: Boric acid, 45.63; lime, 12.26; soda, 6.79; water, 35.32 = 100; whence the formula ($NaO_2BO_3 + 2CaO2BO_3$) + 18aq. Is known in Tarapaca under the name of tiza.

**Ulfilas,** or **Wulfila,** a Gothic bishop and translator of the Bible; born in one of the Gothic settlements to the N. of the Danube in A. D. 311. He was probably of pure, perhaps noble Gothic blood, the story told by Philostorgius, that his progenitors were among the prisoners brought by the Goths from Cappadocia in 258, resting on very insufficient authority. Being sent to Constantinople on an embassy — possibly as a hostage — he adopted the Christianity of the capital, which was then of the Arian type, and was appointed "Anagnostes"; and it was probably while holding this office, which in the Greek Church involves preaching as well as reading, that he executed the Gothic translation of the Scriptures. Early in the year 341, having just reached the required age, he was consecrated bishop of the Goths by Eusebius of Nicomedia at Antioch, and immediately returned to his people across the Danube. After laboring among them for seven years, he and his converts were obliged by the persecution of the heathen prince Athanaric to take refuge within the limts of the Roman empire, and for the rest of his life he continued to labor in the country of the Balkans.

Subsequently to the first Gothic immigration and shortly before the battle of Adrianople in 378 he seems to have been employed in fruitless negotiations between the Gothic and Imperial generals; and three years after (in 381) he died in Constantinople, having gone there partly to remonstrate with a lapsed sect of semi-Arians; partly to petition the emperor for a General Council. He translated into Gothic both the Old and the New Testaments, with the exception apparently of four books (I and II Samuel, and I and II Kings); but only a small proportion of his work has been preserved. Mark is the only one of the Gospels that is complete; the Acts of the Apostles, the Epistle to the Hebrews, those of James, Peter, John, and Jude, and the Apocalypse, are altogether lost; and the Old Testament has left only a few fragments. But the fact that they furnish the oldest text of any German tongue, renders even the minor relics of inestimable value to the philologist. The principal MS. is the "Codex Argenteus," written with silver letters on a purple parchment, which was discovered by Arnold Mercator about the end of the 16th century in the Abbey of Werden near Düsseldorf, and after various vicissitudes was enshrined in silver at Upsala in Sweden. Portions of the Epistle to the Romans were found on a palimpest "Codex Carolinus") at Wolfenbüttel in 1756, and portions of other Pauline epistles on palimpsests at Bobbio by Mai and Castiglione in 1818. A Gothic paraphrase, probably of the 6th century, based on Ulfilas's version of John's Gospel, was

published by Massmann (Munich 1834). The chief editions of Ulfilas are Francis Junius (Dort. 1665, Amst. 1684), Edward Lye (Oxf. 1750), Lahn (Weissentels 1805), Gabelentz and Löbe (Leip. 1843–1860), Massmann (Stuttg. 1857), Stamm (Paderborn 1858, etc., new ed. by Heyne, 1874), and Bernhardt (Halle, 1875).

**Uliasutai,** the capital of the Chinese province of Shensi in Mongolia, on the line between Si-Ngan-Foo and the Russian frontier. It is an important depot for the Central Asiatic trade with China, and is defended by a garrison of Chinese. The population, partly Chinese, partly Mongolian, is greatly increased during the fair by the Mongolian nomads, who pitch their tents in the vicinity.

**Ulke, Henry,** a Prussian American portrait painter; born in Frankenstein, Prussia, Jan. 29, 1821; was educated in Breslau, and studied his art under Professor Wach in Berlin in 1842–1846; was employed in fresco painting at the Royal Museum in 1846–1848. In the latter year he joined the Revolutionary party; and in 1851 came to the United States and established a studio in Washington, D. C. He became well known as an entomologist and also as a musical critic. His portraits include those of President Grant, John Sherman, James G. Blaine, Secretary Stanton, Generals Rawlins, Blair, and Spinner, Professors Baird, Henry, Newcomb, and Bell, Lord Elgin, Sir F. Bruce, Earl Gray, and other prominent men. He died in 1910.

**Ulliac-Trémandeure, Sophie,** a French author; born in Lorient, France, in 1794. Among her stories, all intended for youthful readers, are: "The Fowler" (1825); "Old Daniel's Sundays" (1833); "The Little Hunchback" (1833); "Mother Goose's Stories" (1842); some of her stories were crowned by the Academy. She wrote also "An Old Woman's Reminiscences" (2 vols. 1861). She died in Paris in 1862.

**Ullmania** (named after Ullman, the discoverer of one species), in palæobotany, a genus of *Coniferæ,* apparently a Taxoid, bearing genuine cones; known species two, *U. selaginoides* and *U. brownii.* They occur in the Magnesian Limestone of Durham, the Middle Permian of Westmoreland, and the Kupferschiefer and Rothliegende (Lower Permian) of Germany.

**Ullmann, Karl,** a German theological writer; born in Epfenbach in the Palatinate, March 15, 1796. He was appointed professor in the University of Heidelberg in 1826. Among his works are: "Gregory of Nazianzus" (1825); "Reformers before the Reformation" (1841); "Historical or Mythical?" (1838), a critique of Strauss's "Life of Jesus." He died in Karlsruhe, Jan. 12, 1865.

**Ullmannite** (after J. C. Ullmann, who discovered it), an isometric mineral rarely occurring in crystals; cleavage, cubic; hardness, 5–5.5; sp. gr. 6.2–6.51; luster, metallic; color, steel gray to silver-white; composition: Nickel, 27.7; antimony, 57.2; sulphur, 15.1 = 100. The antimony is, however, sometimes partly replaced by arsenic. Formula, $NiS_2 + Ni(SbAs)_2$. Found in Nassau, Siegen, Prussia, etc., and lately in very sharp, bright cubes in Sardinia.

**Ulloa, Alfonso de,** a Spanish historian. His principal works are: "Life of the Emperor Charles V." (1560); "Life of the Emperor Ferdinand" (1565); "History of the Capture of Tripoli in Barbary" (1566); "History of Europe, 1564–1566" (1570). He died about 1580.

**Ulloa, Antonio de,** a Spanish statesman; born in Seville, Spain, Jan. 12, 1716. He spent many years in North and South America, and was governor of Louisiana in 1766. Among his writings are: "Account of a Voyage to South America" (1748); "American Notes: Physico-Historical Talks on South America and Eastern North America" (1772); "Secret Information concerning America" (1826), confidential reports made to the Spanish ministry. He died near Cadiz, Spain, July 5, 1795.

**Ulloa, Francisco de,** a Spanish military officer. He was a lieutenant with Cortez in the conquest of Mexico, and was sent by his commander in 1540 to explore the Gulf of California. He left Acapulco with three vessels, one of which was lost in a storm. He ascended to the head of the gulf and explored the peninsula on the W. coast. It is not known what became of him, some accounts stating that he was lost at sea, and others that he was assassinated on his return to Mexico. It was through his explorations that Lower California was found to be a peninsula.

**Ulloa, Martin de,** a Spanish philologist; born in Seville in 1730. He wrote "Memoir on the Origin and Genius of the Castilian Language" (1760); "Dissertation on the Origin of the Goths" (1781); "Researches on the First Inhabitants of Spain" (1789); "Dissertation on Duels" (1789). He died in Cordova, Spain, in 1800.

**Ullswater,** after Windermere, the largest of English lakes; between the counties of Cumberland and Westmorland, 5½ miles S. W. of Penrith and 11 E. S. E. of Keswick. Lying 477 feet above sea-level, it is 9 miles long, ¼ to ¾ mile broad, and 218 feet in maximum depth. It is divided into three reaches, which increase in beauty and grandeur as one goes up it from Pooley Bridge to Patterdale, a chief feature of the landscape being the lofty mountain Hel-

vellyn (3,118 feet), which rises from the S. W. extremity of the lake.

**Ulm,** a town of Germany, in Würtemberg; at the base of the Suabian Alps, on a declivity, and on the left bank of the Danube. The city is very strongly fortified, of great age, and has many quaint and curious streets and buildings, many of the tall houses forming the narrow irregular streets being constituted of wood, and most elaborately carved. The cathedral is the great object of admiration, being one of the largest and loftiest Gothic ecclesiastical buildings in Germany. The tombs, stained windows, and shrines, oak carvings, and paintings in oil by the early German masters, which adorn the interior, make the cathedral of Ulm in every respect unique. Manufactures are linen, silks, paper, leather, tobacco, porcelain, and playing cards. Pop. (1905) 51,680.

**Ulmaceæ,** in botany, elmworts; an order of perigynous exogens, alliance Rhamnales. Trees or shrubs, with alternate, rough, generally deciduous leaves, each having at its base a pair of deciduous stipules; flowers loosely clustered, never in perfect or polygamous catkins; calyx membranous, inferior, campanulate, irregular; petals none; stamens definite; stigmas two, distinct; ovary two-celled, each with a solitary pendulous ovule; fruit one or two-celled, membranous or drupaceous; seed solitary. Natives of northern and mountainous parts in Southern Asia, of Europe, and of North America. Known genera nine, species 60 (Lindley); genera three or four, species about 18 (Sir J. Hooker).

**Ulmic Acid,** $C_{24}H_{18}O_9$; a body isomeric with ulmin, obtained by neutralizing the ammoniacal solution of ulmin with an acid. It is precipitated in brown gelatinous flocks, soluble in pure water, but insoluble in water containing free acid.

**Ulmin,** $C_{24}H_{18}O_9$; a dark-colored substance, obtained by boiling sugar for some time with dilute hydrochloric, nitric, or sulphuric acid, and washing the deposit with water. It forms black or brown scales, insoluble in water and alcohol, partially soluble in ammonia.

**Ulmous Substances,** in chemistry, humous substances; names given to various brown or black substances found in vegetable mold, peat, etc., resulting from the putrefaction of animal or vegetable substances in presence of air and water.

**Ulmus,** the elm; the typical genus of *Ulmaceæ*. Flowers perfect; calyx persistent, campanulate, or conical at the base, with three to eight divisions; stamens five, filaments straight in æstivation; ovary two-celled; seed-vessel a samara winged all round; known species about 13. Distribution that of the order. Two species, *U. americana*, the common white elm, and *U. fulva*, the slippery elm, are abundant in America. The bark of *U. campestris* is used in India as an alterative, tonic, and demulcent in chronic skin diseases, especially lepra, psoriasis, and herpes; also as a diaphoretic and diuretic. The bark of *U. wallichiana*, a large deciduous tree from the Northwestern Himalaya, contains a strong fiber especially derived from the flower stalk. An oil is expressed from *U. integrifolia*, another large deciduous tree, a native of the Indian and Burmese hills; its bruised leaves are applied to boils.

**Ulna,** a long prismatiodal bone, at the inner side of the forearm, parallel with the radius, with which it articulates. It is the larger and longer of the two bones, and consists of a shaft and two extremities, the upper of which forms a large part of the articulation of the elbow joint. At the upper extremity behind is a large process, the olecranon, and a smaller one, the coronoid process, in front, separated by the sigmoid or semi-lunar fossa, or olecranoid cavity, which receives the articular trochlea of the humerus. The ulna diminishes in size from above downward, and is very small at the lower extremity, which is separated from the wrist by an inter-articular fibrocartilage.

**Ulnar Artery,** in anatomy, the larger of the two branches into which the brachial artery divides. It commences just below the bend of the elbow, and runs along the inner side of the forearm, in an arched direction and at varying depth, to the hand, where it forms the superficial palmar arch. It gives off several branches.

**Ulnar Nerve,** in anatomy, a branch of the brachial plexus, distributed to the muscles and integument of the forearm and hand.

**Ulnar Veins,** two veins distributed to the forearm: (1) The posterior, arising from the basilic vein. (2) The anterior, arising from the median basilic.

**Ulodendron,** an extinct genus of plants found in the Carboniferous or coal formations. The stem was marked by small scars of somewhat rhomboidal form, and which represented the attachments of leaves or fronds. A double series of larger markings is arranged on opposite sides of the stem, these being absent in *Lepidodendron*. By most palæontologists, Ulodendron is regarded as a near ally of *Lepidodendron*.

**Ulotrichi,** in ethnology, one of the two primary groups into which Bory St. Vincent divided mankind. They are distinguished by crisp, wooly, or tufted hair. The Ulotrichi may be further subdivided into *Dolichocephali*, or long-headed, comprising the Bushmen, Negroes, and Negritoes; and *Brachyccphali*, or short-headed, comprising

only the Mincopies of the Andaman Islands, probably the result of an intermixture of stocks.

**Ulrich, Charles Frederick,** an American artist; born in New York city, Oct. 18, 1858; learned his profession at Cooper Institute and the National Academy. He then studied in Munich, where he was awarded a medal in 1879. For several years he painted in New York city, but in 1884 removed to Italy; was made an associate of the National Academy in 1883. His works include "In the Land of Promise," "The Glass Blowers," "The Wood Engraver," "The Carpenter," "The Waifs," "A Dutch Typesetter," and "Washing of Feet in the Venice Cathedral." He died May 15, 1908.

**Ulrich, Edward Oscar,** an American palæontologist; born in Cincinanti, O., Feb. 1, 1857; received a collegiate education; studied medicine; was curator of geology in the Cincinnati Society of Natural History in 1877–1881; palæontologist on the geological surveys of Illinois, Minnesota, and Ohio, in 1885–1896; and became geologist and palæontologist on the United States Geological Survey. His publications include many works on American palæontology.

**Ulrici, Hermann,** a German philosopher; born in Pförte, Saxony, March 23, 1806. He published in 1833 his "Characteristics of Ancient Historiography." This was followed by his "History of Poetic Art in Greece" (2 vols. 1835), and a "Treatise on Shakespeare's Dramatic Art" (1839), which was received with great favor. His philosophical works include "On the Principle and Method of Hegel's Philosophy" (1841), and "God and Nature" (1862). He died in Halle, Prussia, Jan. 11, 1884.

**Ulster Badge,** in heraldry, the cognizance of the order of baronets. On the institution of this order in England by James I., a sinister hand, erect, open, and couped at the wrist gules, the armorial ensign of the province of Ulster, was made their distinguishing badge in respect of the order having been intended for the encouragement of plantations in Ulster. This badge is sometimes borne in a canton, sometimes on an escutcheon, the latter placed either in the fess point or in the middle chief point, so as to interfere as little as possible with the charges of the shield.

**Ulster King-of-Arms,** the chief heraldic officer for Ireland, whose office was created by Edward VI. in 1552. Under the "King" are two heralds, four pursuivants, a registrar, and a clerk of records.

**Ultenite** (after Ultenthal, Tyrol, where found), in mineralogy, a name suggested for a bonzite, found associated with anthophyllite in the Ulten valley, Tyrol. In petrology, a rock consisting of garnet, kyanite, and mica, found in the Ultenthal, Tyrol.

**Ultima Thule** (Uppermost Thule), a name given in ancient times by the inhabitants of Southern Europe to the remote regions of the unknown North. The Greek navigator Pytheas (who probably lived in the latter part of the 4th century B. C.) made a voyage along the coast of Britain and wrote an account of what he learned about the Shetland and Orkney Islands and possibly the N. mainland, calling the region Thule. The name became vague in its application, especially under the form Ultima Thule. Norway, Iceland, etc., bore the title in turn; and many strange superstitions were current regarding the region.

**Ultimatum,** any final proposal or statement of conditions; especially in diplomatic negotiations, the final terms of the one party, the rejection of which often involves an immediate rupture of diplomatic relations and a declaration of war.

**Ultramarine,** a brilliant blue color in very extensive use by painters, paper stainers, calico printers, and others. The substance previous to the year 1828 was obtained only from lazulite or lapis lazuli, a beautiful and costly mineral substance. The mineral being rare, and much prized for ornamental inlaying, and the color being of unapproachable brilliance and depth, it was an extremely expensive pigment. In consequence, strenuous efforts were made to obtain an equally valuable product by artificial means. In 1824 the French Société d' Encouragement pour l'Industrie Nationale offered a premium of 6,000 francs for the manufacture of an ultramarine blue, possessing all the qualities of that extracted from lapis lazuli, and in 1828 the prize was awarded to M. Guimet of Lyon, who after four years' investigation succeeded perfectly in producing the valuable substance by a synthetical process. The ultramarine thus made was declared by competent judges to be in every way equal to the natural product; and Horace Vernet, who was one of the first to use the material, after employing it in his famous picture, "The Battle of Fontenoy," declared the substance to be even superior to natural ultramarine. M. Guimet's factory has continued since that time to manufacture ultramarine of the highest quality. His process was never made public; but in the same year, 1828, Gmelin, a German chemist, made public a process for manufacturing ultramarine, which was extensively taken up and worked in Germany. These two discoverers may thus be farly credited with the joint honors of this most brilliant triumph of chemical research. The composition of artificial ultramarine varies considerably, as does also its color, the latter showing many tones of blue and violet, and there is fur-

ther a green ultramarine, which is obtained in an intermediate stage of the manufacture. It is prepared by first dissolving silica in caustic soda, to which hydrate of alumina is then added in the proportion of 30 of alumina to 35 of silica. The mixture is dried and mixed with an equal weight of sublimed sulphur and to this again is added a mixture of equal parts of sulphur and sodic carbonate, weighing as much as the silica and alumina mixture. The whole is then submitted for two hours to a red heat is closed crucibles, whereby green ultramarine is produced, and this is again heated in crucibles till the desired blue hue is developed. Ultramarine is manufactured extensively in Germany, France, and Belgium; and for many years Newark, N. J., was the only place of its manufacture in the United States.

**Ultramarine Ashes,** the residue of lapis lazuli, after the chief color had been extracted, was used by the old masters as a middle or neutral tint for flesh, skies, or draperies; it is a purer and tenderer gray than that produced by mixture of more positive colors.

**Ultramontanism,** in Church history, a name improperly given by some theologians, N. of the Alps, before the Vatican Council in 1870, to the generally received opinion of the Church in all ages, that the Papal utterances *ex cathedrâ* on matters of faith or morals are irreformable. The word was used in contradistinction to Gallicanism, which attributed infallibility and supreme authority in matters of faith, morals, and discipline to the entire Church, personified in a General Council. Since the definition of the Vatican Council in 1870 concerning the infallibility of the Pope, Gallicanism has become a heresy.

**Ultra Red,** a term applied to the rays beyond the red, or low, end of the spectrum, From these rays, which are invisible on account of the slowness of their vibrations, the greatest heating effects are obtained.

**Ultra Violet,** a term applied to the rays beyond the violet, or high, end of the spectrum. The vibrations of these rays are too rapid for vision, but they possess greater chemical activity than any others.

**Ulugh Beg,** the grandson of Tîmûr, or Tamerlane; governed Western Turkestan as regent for his father Shah Rokh, while the latter was employed in regulating the affairs of the S. half of the empire, and succeeded in 1447 to the imperial throne on his father's death. He was a successful warrior, as every ruler of this period had to be, but happened, unfortunately, to conceive suspicions of the loyalty of his eldest son, suspicions founded only on astrological indications. The offended and injured prince rebelled, defeated and captured his father, and soon after caused him to be put to death, thus fulfilling the prediction, 1449. Ulugh Beg is known to posterity as the founder of the observatory at Samarcand, as the liberal patron of astronomers, and as himself a most diligent observer. The astronomical tables which bear his name, in all probability compiled by himself and his fellow laborers, enjoy a high reputation for accuracy. The astronomical works of Ulugh Beg were written in Arabic, afterward translated into Persian, and thence the chronological portion of them rendered into Latin by Greaves, who followed with a Latin version of the geographical part in 1652.

**Ululation,** howling. It sometimes happens that articulate sounds or cries resembling, perhaps imitative of, those of animals, or mere shrieking and howling, form the sole or chief symptom and characteristic of a morbid mental state. The act is automatic, and may be regarded as indicative of grave changes in the physical and moral nature. In the Middle Ages, during great religious excitement, and those mental epidemics which involve large communities, such phenomena appear to have been of frequent occurrence. It appears that in the 18th century a family of five sisters in the county of Oxford were affected with a modification of hysteria, during which they howled or barked like a dog, and that about the same period a large religious community of females in France, one and all, and at the same hours, shrieked or mewed like cats, and were only reduced to sobriety and to silence by the presence of military.

**Ulvaceæ,** in botany, an order of green-spored algals, generally marine, rarely fresh-water, or growing in damp places. Fronds membranous, expanded, saccate, tubular, or sometimes filiform, composed of spherical or polygonal cells firmly united into single or double layers. Reproductive organs consisting of roundish spores, formed from the whole contents of the cells or of ciliated zoöspores in twos, fours, or a great number. Widely distributed.

**Ulysses,** in heroic history, one of the most renowned of the Greek heroes. Ulysses was the King of Ithaca, one of the small Ionian isles, the husband of the exemplary Penelope, and father of Telemachus. Ulysses was not only a prudent warrior, but a sage counsellor, and was as much honored in the general conference as he was valued in the field for his military skill, ready expedients, and undaunted courage. When the Greeks undertook the Trojan War, Ulysses, after long declining to join the alliance, at last consented, and, embarking his small but picked band, set sail for the Phrygian shores. During the war he acted a prominent part; he induced Achilles to return to the camp, slaughtered the sleeping Thra-

cians in their tents, entered Troy in disguise, and carried off the palladium of the Trojans. After the fall of the city he embarked on board his fleet, with his followers, to return to his wife and kingdom; but the gods, enraged at his carrying off the palladium, defeated all his efforts to regain his native country, and for 20 years, by adverse winds and fearful storms, made him the sport of winds and waves. At length, after an absence of 30 years, he regained his island home, and found his faithful and still beautiful Penelope surrounded by a host of importunate suitors. Having by strategem obtained an entrance into his palace, and put to the sword the riotous suitors, Ulysses was restored to his throne, to the arms of his wife, and to his son, whom he had left a child. After a reign of 16 years, a natural son of Ulysses, not knowing Ithaca was part of his father's kingdom, landed in the island at the head of a lawless band, and, beginning to plunder the inhabitants, Ulysses hastened to meet the invader; when, in the contest that ensued, he fell by the sword of his son. The adventures encountered by Ulysses on his return voyage form the subject of Homer's poem of the "Odyssey."

**Uma,** in Hindu mythology, one of the principal names of the consort of the god Siva. She is also usually designated under the names Kâli, Durgâ, Devî, Pârvatî, Bhavânî, etc. The myths relating to this goddess, who is worshiped in various parts of India — particularly, however, in Bengal — are met with in the great epic poems and Purânas, in poetical works, such as the "Kumârasambhava," and in modern popular compositions; but the text-book of her worshipers is the "Devimâhâtmya," or "the majesty of Devi"— a celebrated portion of the "Markandeya Purana," considered to be of special holiness by the worshipers of this goddess, and in which are narrated the martial feats of the goddess. The latter consisted chiefly in the destruction by her of two demons, Madhu and Kaitabha, who had endangered the existence of the god Brahman; the demon Mahisha, or Mahishasura, who having conquered all the gods, had expelled them from heaven; moreover, in her defeating the army of Chanda and Munda, two demon servants of Sumbha and Nisumbha. She is often represented holding the severed head of Chanda in her hand, with the heads of his soldiers formed into a garland suspended from her neck, and their hands wreathed into a covering round her loins—the only covering she has in the image constructed for the pûjâ. The worship of Kali (the Black), to which the narrative (of her victory over Chanda and Munda) has given rise, is considered by the Hindus themselves as embodying the principle of "tamas," or darkness. She is represented as delighting in the slaughter of her foes, though capable of kindlier feeling to her friends. She is, however, styled the Black Goddess of Terror, frequenting cemeteries, and presiding over terrible sprites, fond of bloody sacrifices; and her worship taking place in the darkest night of the month.

**Umbagog Lake,** a lake situated largely in the township of Errol, Coos co., N. H.; extending also into Oxford co., Me., where it connects with Richardson Lake. It is about 10 miles in length, and in width varies from 1 to 2 miles. Its altitude is 1,256 feet. Its outlet, a short brook, enters the Magalloway river, which from that point becomes the Androscoggin. The surrounding region is very picturesque.

**Umballah,** the chief town of the district and the division of the same name, in Punjab, British India; 120 miles N. N. W. of Delhi. It is a walled town with brick houses, and is an important military station for all arms, and the railway station for Simla. It was the scene of the great "durbar" of 1869, when Lord Mayo in much state received Shere Ali, the late Ameer of Afghanistan. The district of Umballah, which lies at the foot of the Himalayas between the Sutlej and Jumna rivers, has an area of 2,621 square miles. The crops are wheat, millets, rice, gram, Indian corn, and barley.

**Umbel,** in botany, a kind of inflorescence, in which the pedicels all proceed from a single point like the spokes of an umbrella, and are of equal length or corymbose. When each of the pedicels bears only a single flower, as in *Eryngium*, the umbel is said to be simple; when it divides and bears other umbels, as in *Heracleum*, it is said to be compound. In the latter case the assemblage of umbels is called the universal umbel, and the secondary umbels the partial umbels; or the universal umbel is called simply the umbel and the secondary ones the umbellules. The peduncles supporting the partial umbels are termed radii.

**Umbellales,** in botany, the umbellal alliance; an alliance of epigynous exogens, having dichlamydeous, polypetalous flowers, solitary large seeds, and a small embryo lying in a large quantity of albumen. Orders: *Apiaceæ*, *Araliaceæ*, *Cornaceæ*, *Hamamelidaceæ*, and *Bruniaceæ*.

**Umbellatæ,** in botany, the 22d order in Linnæus's natural system, corresponding to the present *Umbelliferæ*.

**Umbellic Acid,** $C_9H_{10}O_4 = C_6H_3(OH)_2 \cdot C_2H_4 \cdot CO \cdot OH$; a monobasic aromatic acid, obtained by the action of sodium amalgam on an alkaline solution of umbelliferone. It crystallizes in colorless granules, difficultly soluble in cold water, and melts at 125°.

**Umbelliferæ,** in botany, umbellifers; the name given by Jussieu in 1789, and still extensively in use, for a large and easily recognized order of plants, having their inflorescence in the form of an umbel. Lindley called them Apiaceæ, from the genus Apium, and placed the order under his umbellal alliance of epigynous exogens. The flowers, which are white, pink, yellow, or blue, are generally surrounded by an involucre. They have a superior calyx, either entire or five-toothed; five petals, five stamens, two styles, and a two-celled inferior ovary, with a solitary pendulous ovule in each cell. Fruit consisting of two carpels, separable from a common axis, to which they adhere by their face. Each carpel is traversed by elevated ridges, of which five are primary and four secondary. The Umbelliferæ abound in temperate climates in the Northern Hemisphere, but are rare in the tropics. The vegetation of some—as hemlock, fool's parsley, and others—is poisonous, while that of the garden parsley is eaten. Similarly, the stem of the celery, the stalks of angelica, and the roots of the carrot and the parsnip are wholesome articles of food.

**Umber,** a well-known pigment of an olive-brown color in its raw state, but much redder when burnt. It consists of an ocherous earth containing manganese, is durable, has a good body, and is useful in oil and water-color painting. It occurs either naturally in veins or beds, or is prepared artificially from various admixtures. That which is brought from Cyprus under the name of Turkish umber, is the best. It is of a brown citrine color, semi-opaque, has all the properties of good ocher, is perfectly durable both in water and oil, and one of the best drying colors we possess. It injures no other good pigment with which it may be mixed. Also, a variety of peat or brown coal occurring near Cologne, used as a pigment and for the adulteration of snuff. In mineralogy, a clay-like substance of varying shades of a brown color, consisting essentially of a hydrated silicate of alumina mixed with varying proportions of iron and manganese oxides. Used as a pigment.

**Umbeyla,** a mountain pass on the N. W. frontier of British India, leading N. from the district of Peshawar. The total length from the plain to the village of Umbeyla, just beyond the crest, is about 11½ miles. The pass only permits an advance in Indian file, and is everywhere commanded by mountains 4,000 feet high. It is celebrated as the scene of the Umbeyla campaign of 1863. Continual raids had rendered it again necessary to attack the fanatical colony of Mahommedans — Pathans and Hindustanees — who had in 1858 been expelled from Sitana. It was expected to be a mere expedition of three weeks, but Sir Neville Chamberlain, at the head of 9,000 men, was practically blockaded in the Umbeyla pass from Oct. 18 to Dec. 16. The British casualties were 847 killed and wounded, while the enemy are said to have lost 3,000. At last they broke up, owing to internal dissensions, and the rebel settlement at Mulkah, the object of the expedition was burned.

**Umbilical Cord,** or **Navel String,** the bond of communication between the fœtus (which enters at the umbilicus, or navel) and the placenta, which is attached to the inner surface of the maternal womb. It consists of the umbilical vein lying in the center of the two umbilical arteries winding from left to right round the vein. Contrary to the usual course, the veins conveys arterial blood to the fœtus, and the arteries return venous blood to the placenta. These vessels are embodied in a yellow gelatinous matter, known from its first describer (in 1659) as Wharton's gelatine. Nervous filaments have been traced into the cord; but the presence of lymphatics is doubtful. The whole is invested by a membrane (the amnion), and its ordinary length is about 20 inches. As soon as a child is born, and its respiration fairly established, the umbilical cord is tied, and divided near the navel, which spontaneously closes, the fragment of cord dying away.

**Umbilical Hernia,** a hernia which protrudes through the umbilical opening in the middle line at the umbilicus. It is most commonly met with in infants and in women advanced in life, especially in obese subjects.

**Umbilical Ring,** a fibrous ring which surrounds the aperture of the umbilicus, and through which umbilical hernia occurs in children.

**Umbilical Vessels,** a comprehensive name including the two umbilical arteries (continuations of the primitive iliacs) and the umbilical vein of the human fœtus. The latter arises from the placenta, and conveys to the fœtus the blood necessary for its nutrition, the residuum being carried back to the placenta by the umbilical arteries. As soon as respiration begins the arteries are transformed into fibrous cords, and the vein becomes the round ligament (*ligamentum rotundum*) of the liver.

**Umbo** (plural, **Umbones**), in old armor, the pointed boss or protuberant part of a shield. In anatomy, the deepest part of the arched membrane of the drum of the ear, corresponding to the termination of the handle of the malleus. In botany, the boss-like protuberance rising upward from the center of the pileus in an Agaric, etc. In zoölogy, the embryonic shell, forming the point from which the growth of

the valve commences in the *Conchifera.* The umbones are near the hinge because that side grows least rapidly, sometimes they are situated on the margin, but they always become wider apart with age. They may be straight, as in the genus *Pecten;* curved, as in *Venus,* or spiral, as in *Isocardia* and *Diceras.*

**Umbra,** among the Romans, a person who went to a feast as a companion of one invited, whom he thus followed as a shadow; a parasite whose duty it was to laugh at the jokes of his patron. In astronomy, the name given by Dawes to the black central portion of a sun spot. He limits the designation nucleus to patches of deeper blackness occasionally noticed in the umbræ, though the term is sometimes applied to the whole of the darker area. The fringe of lighter shade surrounding a sun spot is called the penumbra. In ichthyology, the sole genus of *Umbridæ,* with two species: *U. krameri,* a small fish three or four inches long, from stagnant waters in Austria and Hungary; and *U. limi,* rather smaller, locally distributed in the United States, where it is known as the dog fish or mud fish.

**Umbral,** in geology, shady; the term applied by Prof. H. D. Rogers to the 14th series of the Appalachian strata, corresponding in period to the Carboniferous limestone of Europe. Maximum thickness in Pennsylvania and Virginia, about 3,000 feet; in the Western States, about 1,000 feet.

**Umbre,** in ornithology, the *Scopus ardetta,* a South African bird called also the hammer head, and brown stork. The body is about the size of that of a crow, plumage umber-colored, lighter beneath; the male with a large crest on the back of the head. These birds prey on frogs and small fish, and embellish their nests with anything bright and glittering they can pick up.

**Umbreit, Friedrich Wilhelm Karl,** a German theologian; born in Saxony, April 11, 1795. He was Professor of Theology in the University of Heidelberg. Among his writings are: "Philological, Critical, and Philosophical Commentary on the Proverbs of Solomon" (1826); "Fundamental Points of the Old Testament" (1843). He died June 11, 1860.

**Umbrella,** a light frame covered with silk, cotton, alpaca, or other fabric, and held above the head as a protection against sun or rain. The use of the umbrella came to us from the East, where it has been in use from remote times, and where it is considered as a symbol of royalty or dignity. As a defense against rain it was not generally used in the Occident till the middle of the 18th century.

In zoölogy, the bell-shaped swimming organ of the *Lucernarida,* akin to the nectocalyx of the *Medusidæ,* but without a velum. In zoölogy and palæontology, Chinese umbrella shell; a genus of *Pleurobranchidæ,* with six recent species, from the Canaries, Mediterranean, India, China, and the Sandwich Islands. Shell small, depressed, and limpet-like, marked by concentric lines of growth; inner surface with a central colored and striated disk, surrounded by a continuous irregular muscular impression. Animal with a very large foot, deeply notched in front, gill forming a series of plumes beneath the shell in front and on the right side. Fossil species four, from the Oölite onward of the United States, Sicily, and Asia.

**Umbrella Bird,** in ornithology, the *Cephalopterus ornatus,* from Peru. It is about the size of a crow, with deep black

THE UMBRELLA BIRD.

plumage; the head is adorned with a large spreading crest, which arises from a contractile skin, and capable of being erected at will; the shafts of the crest-feathers are white, and the plumes glossy blue, hair-like and curved outward at the tips. When the crest is laid back the shafts form a compact white mass, sloping up from the back of the head; when it is erected the shafts radiate on all sides from the top of the head, reaching in front beyond and below the beak, which is thus completely concealed from view. A long cylindrical plume hangs down from the middle of the neck; the feathers of the plume lap over each other like scales, and are bordered with metallic blue. Umbrella birds associate in small flocks, and live almost entirely upon fruits. Their cry, which resembles the lowing of a cow, is most frequently heard just before sunrise and after sunset.

**Umbrella Tree,** a name given to two species of *Magnolia, M. umbrella,* and *M. tripetala,* from the form and position of the leaves. The same name is given to *Pandanus odoratissimus,* the screw pine.

**Umbria,** one of the ancient divisions of Italy; lying W. of Etruria, and N. of the country of the Sabines. It is usually described as extending from the Tiber E. to the Adriatic; but when the Umbrians first came into history they were restricted to the ridges of the Apennines, the lowland region bordering on the Adriatic from the Æsis (Esino) to the Rubicon, being held by a race of Gallic invaders, known as the Senones. The Umbrians were subjugated along with the Etruscans, but joined the Samnites in their last gallant struggle against Rome, and were crushed at Sentinum (295 B. C.).

**Umbrina,** in ichthyology, a genus of *Sciænidæ,* with 20 species, from the Mediterranean and the Atlantic and Indian Oceans. Snout convex, with projecting upper jaw, short barbel under symphysis of the mandible; first dorsal fin with 9 to 10 flexible spines, anal with one or two. *U. cirrhosa,* the *umbrine* or *ombre* of the French, and the *corvo* of the Italians, was well known to the Romans by the name of *umbra.* It is common in the Mediterranean, ranging to the Cape of Good Hope, and sometimes attains a length of three feet.

**Umlaut,** in philology, a kind of assimilation of sounds; the change of the vowel in one syllable through the influence of one of the vowels, *a, i, u* in the syllable immediately following. It is a common feature in several of the Teutonic tongues. In German *umlaut* is seen in the frequent change of the vowels *a, o, u,* to *ä, ö, ü.* In Anglo-Saxon it was also common. The change caused by *a* is called *a-umlaut,* and so of the other vowels.

**Umnak,** an island of Alaska, in the Aleutian peninsula; the extreme W. of the Fox group. Umnak Pass, 5 miles wide, separates it from UNALASKA (*q. v.*) It is 65 miles long by 10 miles wide in its widest part, and lies N. E. by S. W. It is mostly mountainous and owing to its cold climate permits the growth of few ordinary crops, except potatoes. The inhabitants who belong to the Aleuts are very small and for the most part live in Nikolski, a village of less than 300 people. Sealing and fishing comprise the principal industries. The island has a mountain range which culminates in the inactive volcano of Vsevidoff, which is about 8,000 feet high. Numerous hot springs are found ranging in temperature from lukewarm to boiling. Among the deposits are fire clay, fossil-wood, and lignite. The first white man to visit the island was Nikiforoff, a Russian, who stopped there in 1757.

**Umpfenbach, Karl Friedrich,** a German political economist; born in Giessen, Germany, June 5, 1832; was Professor of Political Economy in the University of Königsberg. His principal works are: "Text-Book of the Science of Finance" (1859–1860); "Doctrine of National Economy" (1867); "Capital as related to Civilization" (1879); "Old-Age Insurance and State Socialism" (1883).

**Umrer,** a town in the district of Nagpur, Central Provinces, British India, 28 miles S. E. of Nagpur. It has a considerable trade, being chiefly noted for its cotton goods with embroidered silk borders.

**Umritsir.** See AMRITSAR.

**Unalaska,** a village in Alaska, on the island of Unalaska, the most W. of the group extending from the extremity of the Alaska peninsula. It contains a church, priest's residence, stores, and the warehouses and wharves of the Alaska Commercial Company. Unalaska is the most important settlement in Western Alaska, and the commercial center of all the trade in that region. It is the natural outfitting station for vessels passing between the Pacific and Arctic Oceans. In the mountains back of the village is an active volcano. Pop. (1900) 428.

**Unattached,** or **Non-Collegiate Students,** in the Universities of Oxford and Cambridge, students who, under respective statutes of 1868 and 1869, are admitted members of the university without being attached to any college, hall, or hostel. At Oxford they are under the supervision of two censors, at Cambridge of the vice-chancellor and proctors; and at the latter university the Company of Clothmakers awards them three yearly scholarships of $250, tenable for three years.

**Unau,** in zoölogy, the *Cholœpus didactylus,* the two-toed sloth. The name is also applied to the varieties of this species (which some naturalists raise to specific rank). They are about the size of large monkeys, and range from Costa Rica to Brazil. They differ greatly in the color and length of the hair, which varies from a dark brown to a whitey-brown tint, and some individuals have a kind of crest on the head.

**Uncanonical Hours,** hours in which, in some countries, it is not allowed to celebrate matrimony. These are, in England, before 8 A. M. and after 3 P. M., except in the case where a special license has been granted. In the United States there is no restriction in law.

**Uncaria,** a genus of climbing plants with hooked spines, belonging to the cin-

chona section of the natural order *Rubiaceæ*, natives of the East Indies and tropical America. *U. gambir* is the most important, as yielding the gambier or *Terra Japonica* of commerce, a powerful astringent obtained by boiling the leaves of the plant and then evaporating the decoction till a thick residue results, which is molded and dried in the sun. Gambir is used by the Malays in combination with areca nut and betel leaf as a masticatory. It is also shipped to China for tanning, and to Europe (principally from Singapore) for a similar purpose, serving as a substitute for catechu. Some botanists having united uncaria with the genus *Nauclia*, the name thus dropped was transferred by Burchall to the grapple plant or *Harpagophytum*.

**Uncas,** an Indian chief; born in 1600. He was on good terms with the whites, who constantly defended him and the Mohegans, of whom he was chief, against the Pequods and Narragansetts. In 1657 he is said to have presented the ground on which Norwich, Conn., stands to Ensign Leffingwell in return for his services. He died about 1682.

**Uncial Letters,** characters of a large, round form, used in some ancient MSS. The earliest form of an alphabet is its capitals, and the oldest Greek and Latin MSS. are written entirely in capitals. Uncial letters, which began to take the place of capital letters in the middle of the 5th century, differ from them in being composed of rounded and not straight lines, and exhibiting a tendency toward greater expedition in style. Uncial writing arose as writing on papyrus or vellum became common, the necessity for more rapid execution leading to the practice of curving the lines. It prevailed from the 6th to the 8th, or even to the 10th century.

**Unciform Bone,** in anatomy, the interior bone of the second row of carpal bones. It is sub-triangular in shape, is readily distinguished by the large hook-like process projecting forward and slightly outward on its anterior surface; it serves for the attachment of the annular ligaments and the muscles of the little finger. The unciform bone articulates with the os magnum, the semi-lunar, cuneiform, and fourth and fifth metacarpal bones.

**Uncites,** in palæontology, a genus of *Spiriferidæ*, from the Devonian of Europe. It is allied to *Retzia*, but the beak of the ventral valve is slightly curved, the foramen disappears early, there is no hinge area, and shell structure is impunctate.

**Unclaimed Money,** money resulting from suits in chancery or at common law. The rightful owners having either died or disappeared, the money remains in the care of the court. Lists of names of those entitled to such moneys are published from time to time by private firms who devote themselves to such business.

**Uncle Sam,** the jocular name of the United States government, used as John Bull is with respect to England. It is an extension of the letters U. S. (United States), printed or stamped on the government property. It was first used in Troy, N. Y., in 1812, when certain goods purchased for the government and branded U. S., were officially inspected by Samuel Wilson, whose local nickname was "Uncle Sam." The coincidence of initials suggested the application of the nickname in full to the government.

**Unclean,** foul, impure, wicked. In every ceremonial faith which exists or has existed, distinction exists between what is ceremonially clean and unclean. Food cooked by a Sudra or by an outcast is unclean to the Brahmin, and it is at the peril of his caste if he eat it. He must also avoid unclean persons, as the Pariah, the Mahar, and other outcasts.

In Christianity, Jesus swept away the doctrine that the eating of certain articles of food, deemed ceremonially impure, involved sin, by His sweeping declaration: "Not that which goeth into the mouth defileth a man, but that which cometh out of the mouth, this defileth a man" (Matt. xv: 11; also 12-20; Mark vii: 18); and with regard to persons, St. Peter, after the vision of the sheet let down, would no longer call any man common or unclean (Acts x: 28).

In Judaism, both things on the one hand and persons or beings on the other, might be ceremonially unclean. Regarding things, there were unclean places (Lev. xiv: 40), but the word unclean was especially applied to certain articles of food, as the flesh of animals which had died of disease, or been strangled by man, or killed by beasts or birds of prey, certain animals in all circumstances, and blood. (Lev. v: 2, 3; xi: 40, 41; xvii: 10-16; Acts xv: 29). Regarding persons, one might be made unclean by touching the carcass of an unclean animal of any kind (Lev. v: 2; xi: 26). In some cases this ceremonial defilement was but temporary, continuing only till the evening (xi: 25-28, etc.). Washing the clothes was often an essential step toward the removal of the impurity. A woman giving birth to a man-child was unclean for seven days (xii:2), and to a female child for 14 days (xii: 5), the period of uncleanliness being much shorter than that of her purification (xii: 4, 5). The leper was unclean till the priest pronounced that his loathsome malady was at an end (Lev. xiii: 1-59).

**Unclean Animals,** in Jewish antiquities, certain animals which were regarded as ceremonially unclean, and not therefore to

be eaten. Most animals that "chew the cud" might be eaten, with the exception of the camel, the coney, the hare, and the swine, only the first of which is a true ruminant. A number of birds — the "eagle," the "ossifrage," the "vulture," the "kite," etc.— were to be deemed unclean and abominable. Much difficulty arises in identifying some of the birds referred to; but one broad fact is undoubted — that the Raptores were deemed ceremonially impure, while most of the grain-feeding birds were allowed as articles of food. Unclean fishes were those which had not fins or scales. With the exception of what would now be called the leaping orthoptera — locusts, grasshoppers, etc.— most insects were unclean, as were most creeping things, from vertebrate reptiles to molluscous snails. Not merely were the unclean animals to be rejected as articles of food, their carcasses were to be avoided, as the individual touching them would be unclean (Lev. xi: 1-47). Apart from the ceremonial law, the flesh of the prohibited animals was generally less wholesome than that of those allowed.

**Unconformable,** in geology, the term used when one series of beds is so placed over another that the superior beds repose more or less on the edges instead of on the planes of the inferior series. Thus on the borders of Wales and Shropshire the slaty beds of the Silurian system are curved or vertical, while those of the overlying carboniferous shale and limestone are horizontal. To produce unconformity, three series of events have generally occurred. First, the inferior beds, originally laid down horizontally, must at some subsequent time have been tilted up by a force, probably igneous, from beneath. Secondly, in most cases, the upturned ends of the strata must have been more or less acted on by denudation, which has rendered them a nearly horizontal plane on which fresh strata can easily rest. Thirdly, these fresh strata have been actually deposited. Approximately to measure the interval of time which these changes have occupied, intermediate beds must be sought for in other districts or regions, or failing these, note must be taken of the amount of alteration in life which has occurred during the unknown interval. This may be determined by comparing the fossils in the lower with those in the upper beds. Unconformability is of value in fixing the date of ancient seismic or volcanic action. If it tilted up the lower and had no influence on the upper strata, the irresistible inference is that it occurred between the deposition of the two.

**Unconscious Cerebration,** in mental physiology, the name given to the doctrine that the mind may undergo modifications, sometimes of very considerable importance, without being itself conscious of the process, till its results present themselves to the consciousness in the new ideas, or new combination of ideas, which the process has evolved. This doctrine has been current among German metaphysicians from the time of Leibnitz to the present day, and was systematically expounded by the late Sir William Hàmilton.

**Uncovenanted Civil Service,** a branch of the British Indian Civil Service, whose members (Europeans or natives) are subject to no entrance examination, nor entitled to promotion or retiring pension, and also may resign their office at pleasure.

**Uncovenanted Mercy,** in theology, an expression used of something not promised by God in any covenant, and specially in the covenant of grace or redemption. For instance, to give Eternal Life to those who believe in Christ promised by God (John iii: 14, 15) is now regarded as part of a covenant on the part of God, with those who believe in Christ, to extend salvation to those who have not had opportunity of hearing of Christ, is held to be an uncovenanted mercy. It has been held by such Churches as claim to be in the Apostolic Succession that the administration of the Covenant of Grace is entrusted solely to the successors of the apostles, and that persons who do not receive the ordinances of religion from them, if saved at all, are saved by the uncovenanted mercies of God.

**Uncrystalline,** in mineralogy, not crystalline. Seeley, in Phillips, considers the uncrystalline type to consist of a volcanic rock, originally amorphous, sometimes glassy like obsidian or tachylyte, and often in the microfelsitic state. There is a complete transition between the uncrystalline and the semi-crystalline rocks.

**Unction** ("anointing with oil"), a practice perhaps reaching back to the rudest form of nature worship. In the worship of the reproductive principle of nature, stone or wooden pillars were set up as rude forms of the phallic symbol, and in further symbolism oil was poured on the top (Gen. xxviii: 18). To this day in certain parts of India every village has its sacred stone, on which newly-married and barren women come and seat themselves after pouring oil on its top. But after the first rude meaning was lost, a sacredness continued to be attached to unction. Thus among the Jews there was a holy anointing oil prepared with perfumes (Exod. xxx: 22-33), with which the priests, and the tabernacle, and all its furniture, were anointed. Kings, too, were installed in their office by unction, often seated on a sacred stone. It was considered to be efficacious even in healing the sick, and seems to have been used for this purpose in the early Church (James v:

14). It soon came to be employed not only in this way, and at the consecration of priests, but in all the principal sacraments.

**Unctuous Sucker,** in ichthyology, the *Cyclopterus liparis*, a small, pale-brown fish, irregularly striped with lines of a darker color; from N. seas. It is about four inches long, and the surface of the body is soft and slimy, whence the popular name. Called also sea snail.

**Undecylic Acid,** $C_{11}H_{22}O_2 = C_{10}H_{21}\cdot CO\cdot OH$; obtained by the oxidation of methyl-undecylketone. It melts at 28.5°, and boils at 212°-213°, under a pressure of 100 mm.

**Under Clay,** in geology: (1) Clay, or firestone, generally in a series of beds, each underlying a seam of coal. As the underclay abounds in *Stigmarias*, which are roots, and portions of flattened trunks often exist in the coal, the natural inference is that, while each seam of coal represents the remains of an old forest, the under clay on which it rests was the soil in which the trees grew. (2) Any bed which seems to have once constituted surface soil.

**Undercliff,** a tract of country on the S. E. coast of the Isle of Wight, extending from Bonchurch to Niton. It is well protected from the colder winds, and the climate is remarkably equable, as well as mild and dry, so that there are few days in winter when the invalid cannot take outdoor exercise; an excellent climate for the pulmonary valetudinarian.

**Underground Railway,** a railway wholly or in a large part beneath the street surface of a city. Under the more recent name of "subway" such means of communication are now found in New York, Brooklyn, Chicago, Boston, Philadelphia, Jersey City, Hoboken, and other American cities, and in London and Paris; and under the popular name of "tube" they have been extended beneath the North and East rivers at New York city. The term was originally applied in the United States to the organized means for assisting fugitive slaves to escape to the free States of the Union, or to Canada. See BOSTON: NEW YORK CITY: SUBWAY.

**Underground Stem,** an organ in some plants popularly considered a root because during the whole of its existence it remains below the ground, but which nevertheless possesses a structure, showing that it is really a stem.

**Undershot Wheel,** in hydraulics, a water wheel moved by water passing beneath; in contradistinction to the overshot, in which it is received above; the breast wheel, in which it is received at or nearly on a level with its axis, the turbine, in which it runs through; and some others. Poncelet's water wheel has buckets of a curvilinear form, open at the back, without a sole plate, to secure ventilation. The water impinges on each bucket at nearly the lowest point of the wheel, the shuttle being arranged to draw upward; and as the water enters it follows the curve of the bucket, rises and falls over into the next in succession. In this way the force of the water is expended directly on the wheel, instead of a portion of it being wasted in its passage along the sluice.

**Underwood, Benjamin Franklin,** an American author; born in New York city, July 6, 1839; entered the United States army in 1861 as a private in the 15th Massachusetts Volunteers; served at the battle of Bull Run; was wounded and captured, and on his exchange in 1862 became 1st lieutenant and adjutant of the Rhode Island Heavy Artillery. After the war he devoted himself for 30 years to lecturing and was especially prominent in 1870–1885 as a representative of the religious "free thought" movements. He was business manager and co-editor of the Boston "Index" in 1880–1886, and the "Open Court" in Chicago, Ill., in 1887; editor of the "Illustrated Graphic News" in 1888 and the "Philosophic Journal" in 1893–1895; secretary of the Psychical Science Congress at the World's Columbian Exposition at Chicago, in 1893; and an extensive contributor to various magazines and journals. His publications include: "Influence of Christianity on Civilization"; "Letters of Junius"; "Spencer's Synthetic Philosophy"; "Christianity and Civilization"; etc.

**Underwood, Francis Henry,** an American author; born in Enfield, Mass., Jan. 12, 1825. He was an active abolitionist; clerk of the Massachusetts Senate in 1852; afterward literary editor of the publishing house of Phillips, Sampson & Co. He assisted in the management of the "Atlantic Monthly" for two years; was elected clerk of the superior court in Boston, which position he held for 11 years. In 1885 he was appointed United States consul at Glasgow; in 1888 the University of Glasgow conferred upon him the degree of LL. D. His works include a "Hand-Book of American Literature" (1872); "Cloud Pictures," a series of imaginative stories musical in theme (1877); "Lord of Himself," a novel of old times in Kentucky (1874); "Man Proposes" (1880); "The True Story of Exodus," an abridgement of Brugsch Bey's work (1880); and biographical sketches of Longfellow (1882); Lowell (1882); and Whittier (1883). He died in Edinburgh, Scotland, Aug. 7, 1894.

**Underwood, John Cox,** an American military officer; born in Georgetown, D. C., Sept. 12, 1840; was graduated at the Rensalaer Polytechnic Institute, in Troy, N. Y., in 1862; served with distinction in the Confederate army during the Civil War; was

mayor of Bowling Green, Ky., in 1870–1872; city, county, and State engineer in 1866–1875, and lieutenant-governor of Kentucky in 1875–1879. He was prominent in several secret fraternal organizations and Confederate patriotic societies; published many reports embracing plans for architectural and civil engineering works; and in 1896 was chosen superintendent and secretary of the Confederate Memorial Association.

**Underwood, Lucien Marcus,** an American botanist; born in New Woodstock, N. Y., Oct. 26, 1853; spent his youth on a farm, and was graduated at Syracuse University in 1877. He was instructor in several colleges in Illinois in 1879–1883; at Syracuse University in 1883–1891, and at De Pauw University in 1891–1895. He was made Professor of Botany at Columbia University in 1896. He was the author of "Descriptive Catalogue of North America Hepaticæ" (1884); "Moulds, Mildews and Mushrooms" (1899); and "Our Native Ferns and How to Study Them" (1900); etc.; also editor of the "Bulletin" of the Torrey Botanical Club. He died Nov. 16, 1907.

**Underwriter,** one who writes his name at the foot of a policy of insurance. On some policies, only one such name appears; on others several names are added, when each party thus entering his name, is said to "take a line." The system still prevails abroad, but there are also numerous companies whose business it is to grant marine insurances. The underwriters of American cities do not confine their business to marine insurance, but fire-risks, etc., are now taken.

**Undine,** in the Paracelsian system, a water nymph; an imaginary being inhabiting water, and possessing many characteristics in common with the salamanders living in fire, the sylphs living in the air, and the gnomes living in the earth. The Undines had not originally a soul, but intermarrying with human beings they obtained one, and became liable to the ordinary conditions of humanity.

**Undue Influence,** in law, a phrase used specially in connection with voting or the making of a will. In the first case it consists of bribery or any force, violence, restraint, threat to inflict injury or intimidation, designed to coerce a person into voting for a particular candidate, or abstaining from voting at all, or as an infliction because of his having done so. The perpetrator exposes himself to a legal penalty. In case of a contested election the principal may be declared, by the court, not elected. In the case of a will, undue influence is exerted when one acquires such an ascendency over the testator's mind as to prevent the latter from being a free agent. If he spontaneously bequeath money to one whom he esteems or loves, the esteem or affection does not constitute undue influence. Importunity does. When undue influence is proved the will becomes void.

**Undulatory Theory,** in optics, the generally accepted theory which traces light to vibrations set up and transmitted as waves in an invisible medium termed the luminiferous ether. This, it is assumed, is (sensibly) imponderable, and almost infinitely elastic, and fills all space, passing freely through the pores or between the atoms of bodies as the wind does through the trees, but having its motions, in a somewhat analogous manner, hindered or modified thereby, and thus accounting for the retardation which is the principal factor in producing refraction. Luminous bodies are believed to be (and in the case of heated luminous bodies are known to be) in a state of intense molecular vibration, and these successive impulses communicated to the ether give rise to successive waves of radiant energy, whose effects on other bodies depend on their rate, as the pitch of a sound does. The slower periods apparently cause heating effects only; more rapid impulses produce luminous and chemical effects as well, and energetic chemical action is exerted by waves far too rapid to produce luminous impressions. Within the luminous range each rate produces on the normal retina the sensation of one given color only, while a proportion of all periods mixed produces that of white. In the phenomena of reflection, refraction, dispersion, and ordinary interference, there is nothing to define the direction of the actual ethereal vibrations; but the facts of polarization demonstrate that these must be at right angles to the path of the ray, which again implies that the ether, rare and subtle as it is, must have the chief distinguishing quality of solid, or resemble a thin but solid jelly rather than a fluid. This is believed to be the case, and the ether is also believed to be the medium through which electricity and other forms of energy are transmitted. The undulatory theory is usually ascribed to Huyghens, but was firmly established by the convincing experiments and reasoning of Young and Fresnel. Newton adopted the corpuscular theory, but in the second edition of his "Opticks" he added "queries," showing that later he was very strongly disposed to adopt the other.

**Unfermented Wine Agitation,** a disturbance which originated in the dissenting communities in Scotland caused by some extreme abstainers, who insisted that communion wine must be administered free from alcohol. The agitation was not received with much favor by the public, but it cannot be said to have wholly died away.

**Unformed Stars,** stars which, owing to the isolated position which they occupy, are

not grouped into any constellation. Called also informed and sporadic stars.

**Ungava,** a district of the Northwest Territories (*q. v.*), Dominion of Canada, bounded on the E. by the narrow strip of the Labrador peninsula, which is a dependency of Newfoundland; on the W. by Hudson and James bays; on the N. by Hudson strait and Ungava bay; and on the S. by the province of Quebec. Area, 354,961 square miles, of which 5,852 square miles are under water. Several islands in Hudson bay and in Ungava bay are included in the territory of the district.

The physical characteristics are striking. Geologically, the prevailing formation is crystalline rocks and Palæozoic limestones. Glacial action has marked the surface. A plateau varying from 400 to more than 2,000 feet in height occupies the larger part of the interior. The mineral deposits are known to be rich, though little or nothing has yet been done to develop them. Copper, gold, and nickel are found, and immense deposits of iron ore have been reported. The interior, which has not been thoroughly explored, contains a large number of lakes and much marsh land, and very little of the soil is known to be fit for cultivation. The chief rivers are the Kaksoak, Hamilton, Big, Great Whale, and Kaniapiskau. The chief lakes are Upper and Lower Seal, Michikamow, Kaniapiskau, and Petitsikapow. The course of the Hamilton river is noted for the magnificent Grand falls, 315 feet in height, and one of the greatest falls on the continent. The climate of Ungava is very severe, with long, cold winters and short, hot summers. There are spruce, pine, and birch forests in the central and S. parts, but little or no vegetation in the N. The inhabitants, who numbered 5,113 in 1901, are chiefly Indians.

**Unger, Franz,** an Austrian botanist; born in Leutschach, Styria, Nov. 30, 1800. Among his works are: "On the Influence of Soil on the Distribution of Plants" (1836); "The Primordial World" (1851); "Anatomy and Physiology of Plants" (1855); "Scientific Memorabilia of a Tour in Greece and the Ionian Islands" (1862); "The Island of Cyprus" (1865). He died in Gratz, Germany, Feb. 13, 1870.

**Ungulata,** in zoölogy, a provisional group of mammals, the living members of which correspond to the *Pecora* and *Belluæ* of Linnæus, and the *Ruminantia* and *Pachydermata* of Cuvier. The dentition is heterodont and diphyodont, the milk-teeth not being completely changed till the animal attains its full development; the molars have broad crowns with tuberculated or ridged surfaces; clavicles absent; toes with broad, blunt nails, or, in most cases, with hoofs, more or less inclosing the ungual phalanges; scaphoid and lunar bones of carpus distinct. The group is usually divided into two minor groups: *U. vera*, often called simply *Ungulata*, and *Subungulata*. All the species are eminently adapted for a terrestrial life, and, generally speaking, for a vegetable diet. Some are, to a greater or less extent, omnivorous, as *Sus;* but no genus is distinctly predaceous. Also, true ungulates; a group of mammals classed as an order, or as a group of the wider *U.* Feet never plantigrade, functional toes never more than four, the first digit being suppressed; allantois largely developed; placenta non-deciduate; uterus bicornuate; mammæ usually few and inguinal (as in *Equus*), or many and abdominal (as in *Sus*), but never wholly pectoral. There are two divisions: *Artiodactyla* and *Perissodactyla*, first indicated by Cuvier and established by Owen, who proposed the names now in general use. In palæontology, the *Ungulata* appear first in the Eocene Tertiary, in which period the *Artiodactyla* and *Perissodactyla* were already differentiated.

**Unguled,** in heraldry, having hoofs of such or such a tincture. (Said of the horse, stag, etc., when the hoofs are borne of a different tincture from that of the body of the animal.)

**Ungvár,** a town of Hungary, on the Ung river; 325 miles N. E. of Budapest. It is the residence of a Uniat bishop, and contains a cathedral, convent, seminary, normal school, and Catholic gymnasium. Porcelain earth is exported.

**Unicardium,** in palæontology, a doubtful sub-genus of *Corbis*, having the shell thin, oval, and concentrically striated; the hinge with an obscure tooth or edentulous; known species 40 from the Lias to the Portland Rock.

**Uniclinal,** in geology, having but a single dip, inclination, or direction. Used of a stratum which slants only in one direction; opposed to synclinal and anticlinal.

**Unicorn,** an animal having a single horn, frequently mentioned by Greek and Latin authors. Ctesias calls it the wild ass, and Aristotle the Indian ass. Ctesias describes the wild ass as being about the size of a horse, with a white body, red head, and blue eyes, having a horn on the forehead a cubit long, which for the extent of two palms from the forehead is entirely white, black in the middle, and pointed and red at the extremity. Of the horn drinking cups were formed, and those who used them were said not to be subject to spasm, epilepsy, or the effects of poison. Unicorns were said to be very swift and strong, not naturally fierce, but when provoked they fought desperately with horn, heels, and teeth, so that it was impossible to take them alive. Browne enumerates five kinds of unicorns: "The Indian ox, the Indian ass, the rhinoc-

eros, the oryx, and that which was more eminently termed monoceros or unicornis"; and in the same chapter he quotes descriptions of this mythical animal from various authors. Wilkin, in a note to Browne, gives a statement from Rüppell that the unicorn exists in Kordofan, where it is known by the name of *millekma*. He describes it as of a reddish color, of the size of a small horse, of the slender make of a gazelle, and furnished with a long, straight, slender horn in the male, which is wanting in the female. Some added that it had divided hoofs, while others declared it to be single-hoofed. Three Arabs told Rüppell that they had seen the animal in question. All these stories have probably some foundation in fact, to which a large superstruction of fiction has been added. An antelope like an oryx, seen in profile would appear to a careless observer like an animal with a single horn; and hence the mythical tales of unicorns probably arose.

In heraldry, a fabulous animal, having the head, neck, and body of a horse, with a beard like that of a goat, the legs of a buck, the tail of a lion, and a long tapering horn, spirally twisted, in the middle of the forehead. Two unicorns were borne as supporters of the Scotch royal arms for about a century before the union of the crowns in 1603; and the sinister supporter of the arms of the United Kingdom is a unicorn argent, armed, crined, and unguled or, gorged with a coronet of crosses patée and fleurs-de-lis, with a chain affixed passing between the fore legs and reflected over the back of the last.

Sea unicorn, the narwhal, *Monodon monoceros*.

**Unicorn Plant,** a popular name for *Martynia*, said to refer to the projecting beaks or hooks of the capsule; but the name is inaccurate, as there are two horns in place of one.

**Unicorn Root,** a popular name of the plant *Aletris farinosa*, a native of North America, which furnishes one of the most intense bitters known, used as a tonic and stomachic.

**Unicorn Shell,** in zoölogy, the genus *Monoceros*. Both the scientific and popular names refer to the prominent spine on the outer lip.

**Uniformitarianism,** in geology, a term introduced by Professor Huxley to express the view strongly advocated by Hutton and Lyell, that there is no need for the hypothesis of alternate periods of repose and convulsion to account for the present appearance of the earth's crust. All that we see might be — and they believed was — produced by the operation of ordinary causes continued during indefinitely long periods of time.



**Uniformity, Act of,** in English Church history, the Act 13 & 14 Car. II., c. 4, designed to regulate the terms of membership in the Church of England and in the colleges of Oxford and Cambridge. Both the Anglican and the Puritan parties had desired their faith to be that of the Church of England, and Charles II., who, as a step to obtaining his father's throne, wished to stand well with both parties, promised at Breda to use his influence to bring about a certain measure of comprehension. But the Parliament was in no mood to vote for such a scheme, and the Act of Uniformity required the clergy to sign the Thirty-nine Articles and to use the Book of Common Prayer. The enforcement of these regulations led to the secession from the Church of England of upward of 2,000 clergymen, and laid the foundation of modern dissent. The Act of Uniformity Amendment Act, passed July 18, 1872, somewhat modified that of Charles, as the University Test Act, passed June, 1871, had done the year before.

**Unigenitus Bull,** one of the most important documents in the history of Jansenism. It was occasioned by the publication of the "Moral Reflexions" of Quesnel, in which all the essential principles of Jansenism were revived, and although cautiously, yet systematically explained, so as to form the basis of that practical, moral, and religious teaching which it is the object of the "Moral Reflexions" to convey. The book was at first simply prohibited by a brief of Pope Innocent XI., in the year 1708; but as it found many patrons, and especially the Archbishop of Paris, Cardinal de Noailles, it was deemed necessary to subject it to a more detailed examination, the result of which was that 101 propositions were extracted from it, and formally condemned, in 1713, by a bull commencing with the word "Unigenitus." The mode of condemning these propositions was peculiar, being that which is technically called *Damnatio in globo*. The whole body of propositions were condemned as "heretical," "false," "rash," "scandalous," "offensive to pious ears," etc., without, at the same time, any particular propositions being pointed out as deserving any one of these specific forms of censure. This circumstance, with others, gave rise to much controversy and to a prolonged opposition to the bull. De Noailles and other bishops refused to accept it unless with certain qualifications; on the contrary, Louis XIV. insisted on unconditional acceptance; but on the death of Louis, the regent, the Duke of Orleans, having given his countenance to the opponents of the bull, the resistance was persisted in; and eventually a declaration was put forth in 1717, by certain bishops, four in number, appealing from the Pope to a gen-

eral council. This appeal was condemned by the Pope, nor was it countenanced even by the regent; but a more modified appeal "from the Pope ill-informed to the Pope better-informed," was afterward published by De Noailles, which obtained many adherents, and by which the opposition was kept alive to the end of the pontificate of Clement XI. in 1721, and even under his successors, Innocent XIII. and Benedict XIII. It was not till the year 1730 that, after the formal registration of the Bull Unigenitus by the Parliament of Paris, the party thus created in France, and known under the name of "Appellants," received its final condemnation from the civil authority, after which it gradually died out, though some relics of it are still traceable, even after all the storms of the Revolution, in the so-called "Little Church." See JANSENISM.

**Unio,** in zoölogy, river mussel; the type genus of *Unionidæ*, with more than 400 species, from all parts of the world. Shell oval or elongated, smooth, corrugated, or spiny, becoming very solid with age; anterior teeth, 1–2 or 2–2, short, irregular; posterior teeth, 1–2, elongated, laminar. Animal with the mantle margins only united between the siphonal openings; palpi long, pointed, laterally attached.

**Union, The,** in English history, the uniting of the Parliaments of Scotland and England by the Act of Union, 1707; also, the legislative union of Ireland with Great Britain in 1800. The Union is a term frequently applied to the United States of America.

**Union Biblical Seminary,** the theological seminary of the United Brethren in Christ, at Dayton, O., founded in 1871. The General Conference of the United Brethren Church, held in Lebanon, Pa., May, 1869, instructed the bishops to appoint a board of education, whose duty it should be, besides seeking to promote the general work of education in the Church, to devise and adopt a plan for founding a Biblical Institute to be under the control of the General Conference, and to take measures to raise funds, to locate the institution, and to proceed with its establishment as soon as possible. In accordance with this measure this board met, July 29, 1870, and passed resolutions soliciting $100,000 for the founding of the proposed institution, to be located in Dayton, O., to be called United Brethren Society. At the second meeting of the board, Aug. 2, 1871, it was resolved to open the seminary, Oct. 11, 1871. Rev. John Kemp having donated lots valued at $10,000, a fine and commodious building was erected thereon, which has been occupied since September, 1879.

**Union Christian College,** a coeducational institution in Merom, Ind.; founded in 1859 under the auspices of the Christian Church; has an endowment exceeding $100,000; grounds and buildings valued at over $95,000; volumes in the library, about 4,500; scientific apparatus, etc., $5,000; average number of faculty, 18; average student attendance, 265; ordinary income, about $9,000.

**Union College,** a coeducational institution in Barbourville, Ky.; founded in 1886 under the auspices of the Methodist Episcopal Church; has endowment funds, grounds and buildings, and scientific apparatus, etc., valued at over $350,000; average number of faculty, 12; average student attendance, 255; volumes in the library, about 5,000; ordinary income, about $10,000.

**Union College,** a coeducational non-sectarian institution in College View, Neb.; founded in 1891 under the auspices of the Seventh Day Advent Church; has grounds and buildings valued at over $175,000; average number of faculty, 45; average student attendance, 600.

**Union University,** an American institution of learning established in Schenectady, N. Y., in 1795 by several religious denominations, from which fact it derives its name. It was the first non-sectarian college incorporated in the United States. The movement for the founding of such an institution was inaugurated in 1779, when 500 citizens of Eastern and Northern New York petitioned the Legislature in its behalf. This request was refused, but an academy was started in Schenectady in 1785, which on Feb. 25, 1795, became Union College. The first president was the Rev. John Blair Smith. In 1804 the Rev. Eliphalet Nott was elected president and held the office till 1866, the longest term of service of any college president in the history of the United States. During his incumbency the University became one of the best known educational institutions in the country. The Dudley Observatory, the Albany Law School, and the Albany Medical College became parts of it in 1873. There are also separate departments in civil engineering and pharmacy. The University has an endowment exceeding $600,000; grounds and buildings valued at over $575,000; volumes in the library, about 41,000; average number of faculty, 27; average student attendance, 340; ordinary income, about $175,000.

**Union Fabrics,** textile fabrics made of a mixture of different materials, as cotton and wool, cotton and silk, and similar mixtures, in which flax, hemp, jute, etc., are mixed with other fibrous materials.

**Union Flag,** the national banner of the United Kingdom of Great Britain is formed by the union of the cross of St. George (red

on a white ground), the diagonal cross or saltire of St. Andrew (white on a blue ground), and the diagonal cross or saltire of St. Patrick (red on a white ground). The national flag of England was the banner of St. George (heraldically described as argent, a cross gules), and soon after the union of the crowns this was united with the Scotch national flag or banner of St. Andrew (in the language of heraldry azure, a saltire argent), thus forming the first union flag. On the legislative union with Scotland (1707) a new design for the national or union flag was adopted, described in heraldic terms as azure, a saltire argent surmounted by a cross gules fimbriated or edged of the second. On the union with Ireland (1800) the red cross or saltire of St. Patrick was introduced, thus producing the flag as it now exists. The union flag, when used by itself or as an independent flag, is the national banner always used on shore. When it occupies the upper corner or canton next the staff of a red, white, or blue field, the flag so formed is called the red, white, or blue ensign, and in this form it is only used on board ship. The union flag is often spoken of as the "union jack," but it is not properly speaking a "jack," unless it is flown on the "jack-staff," a staff on the bowsprit or forepart of a vessel.

**Unionidæ,** in zoölogy, a family of *Conchifera,* with several genera, universally distributed. Shell usually regular, equivalve, closed; structure nacreous; epidermis thick and dark; ligament external, large and prominent; margins even; anterior hinge-teeth thick and striated, posterior laminar, sometimes wanting. Animal with mantle margins united between the siphonal orifices, and, rarely, in front of the branchial fringed; foot very large, tongue-shaped, compressed, byssiferous in the fry; gills elongated, sub-equal, united posteriorly to each other and to the mantle, but not to the body; palpi moderate, laterally attached, striated inside; lips plain. The sexes are distinct.

**Unionism and Labor Unions.** To the historian of our time two events will stand out, each of which by some will be regarded as a grave danger to American institutions, and by others as the most perfect instrument of development and progress. Almost every American has already taken his position firmly, though perhaps unconsciously, in support of one or the other of these views.

The first of these events is the organization of the greatest corporation in the world; for the United States Steel Corporation, with a capital of more than $1,000,000,000, is merely the extreme manifestation of the tendency toward the combination of moneyed interests under the control of a single man or of a group of men, in other words the widespread establishment of money monarchies.

The second of these events is the nearly complete unification of the workingmen in coal mining, — one of the most important of American industries. Their organization, the United Mine Workers of America, has now the largest membership and perhaps the greatest influence of all the trade unions ever formed. Its membership is more than 190,000, supporting a population of nearly 1,000,000 people and influencing a much greater number. The United Mine Workers in their turn are only the extreme example of the tendency toward the more perfect combination of labor in every branch of industry. Indeed, never before were the workingmen so thoroughly organized, or the unions so rich or so determined. Every tenth voter in America is a member of a labor organization.

The chief purposes of both kinds of organization may be stated in almost identical language: to regulate competition — one with rival (nonunion) companies, the other with rival (nonunion) labor; to control markets — one the market for its various products, the other for its only product, labor; to regulate wages — one to pay as little as possible, the other to get as much as possible. The methods of accomplishing these purposes are also curiously similar. Both seek stronger and closer organization in order to crush out the nonunionist, whether company or "scab"; both offer money benefits, the one in dividends the other in insurance, sick and out-of-work benefits, which in the long run amount to the same thing; both seek to extend their own markets — the one by controlling sources of production, securing lower freight rates and so on, the other by the use of the boycott and the union label; and both seek for favorable legislation.

Finally, the tendency of organization on each side is remarkably similar. The familiar idea of "community of interest" has been worked out in the Steel Corporation for most of the important financial interests of the country — the Standard Oil Company, the copper interests, the great banks, the railroads, ocean transportation companies, mines and mills — are represented in its directory. The same sort of solidarity, though possibly less in degree, exists on the side of labor. In the councils of the American Federation of Labor are the officers of such organizations as the United Mine Workers, the Brotherhood of Carpenters, the Machinists, the Cigarmakers, the Garment Workers, the Iron and Steel Workers, the Textile Workers, the Painters, the Clerks, the Coopers, and several score of other national and international unions, representing a membership

of 2,000,000 men. It is nothing that a few prominent unions, like the four brotherhoods of railway workers, the Bricklayers and the Plasterers, are still outside of the combination; so there are independent steel plants outside the Steel Corporation, yet the federation on one side and the corporation on the other are strong enough to control the situation; and it is safe to say that the organizations outside the American Federation are much more in harmony with the master body than the independent steel companies are with the "trust." Indeed, there is apparently just enough outside opposition in each case to quicken the energy of the leaders.

Another similarity is the growing centralization of power in the hands of a few men. Reference was made to a "monarchy of money;" labor, too, is growing more and more a monarchy. Trade unionism is tending toward the centralization of power in national and international unions, each of a single industry, the governing board of which, and especially the president himself, is yearly getting greater power. A few years ago the members of almost any local union, say in New York City, could throw down their tools and strike. But now permission must usually be obtained from the officers of the national organization, who are perhaps located in a distant city. More and more, also, is the money collected by the unions coming under the control of a few national leaders. In some unions, as in the case of the Cigarmaker's International Union, the members in their collective capacity, by their vote, determine whether strikes shall be approved or disapproved. All benefits paid are in accordance with laws made by the initiative and referendum of the membership or by their approval of the referendum vote in cases of strikes or lockouts.

The first great general organization of labor in this country, the Knights of Labor, which still has an enfeebled existence, was modeled on the fraternity system. It had all the paraphernalia of passwords, regalia and ceremony known to Freemasonry; it laid great stress on secrecy, and it accomplished much in arousing workingmen to a realization of their own power when properly organized. But while it gave social expansion, it could not secure the desired practical results in higher wages, shorter hours and more favorable laws. Moreover, it made the fatal mistake of dabbling in politics, thus arousing the party animosities of its members. But the moral defect of the Knights of Labor lay in its fundamental composition. It depended on the adhesive strength of class feeling — workingmen for workingmen—a mere sentiment, whereas the new unionism derives its great adhesive strength from a narrower but much stronger feeling — the trade feeling, the

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common interests of plumber with plumber, and printer with printer. A single body of the Knights might contain carpenters, garment workers, brewers, bakers, and so on — a jumble of trades without common interests, common grievances, or common aspirations, and with not a few rivalries. Obviously, the broad, theoretical interests of workingmen as a class could not overcome the nearer and more vital trade interests and rivalries.

The unit of the new unionism is the local union composed wholly of workers in a single trade, a union of printers here, of plumbers there, every man in each union depending on the same employment for his daily bread, earning practically the same wages, working the same hours, meeting the same difficulties and achieving the same successes.

Obviously, a union of this sort would become at once highly effective; it needed no Masonic mystery and comparatively little artificial social attraction to hold it together. Thus the unions have become nonsecret, intensely practical business bodies. At the same time they have steered wide of attempting united political action. This does not mean that labor has not influenced legislation; its successes in securing favorable laws during the past few years have been notable, but as yet little attempt has been made to unite the labor vote.

Each local union has the regular officers, including the important business agent (once called "walking delegate," a name now generally discarded). One officer, usually the secretary-treasurer or the business agent in large unions, sometimes both, receives a salary equal to the pay which he would get if he worked at his trade, together with small expense allowances. Members are usually required under penalty of fines to attend a meeting of the union once a month, or once in three months, though in some cases where the unions are very large no such requirement exists. For instance, "Big Six," New York Typographical Union, including all the printers of the city, would require a very large building to contain its 5,500 members. But this is the largest local union in America. The cigarmakers have no fewer than 10 local unions in New York City, with a membership of nearly 6,000, an average of 600 members to the union.

Certain unions of peculiarly skilled workmen require a rigid examination before admission — the electrical workers, for instance, who maintain a regular examining board, consisting of two members of their union and two members of the employers' association, before whom the applicants appear and answer a carefully prepared set of questions. Membership in the union becomes a certificate of skill and the employers recognize it as such. On one occasion an

electrical workers' union in New York paid back more than $2,800 in fees advanced by applicants for admission who failed to pass the examination. The steam fitters and other unions have equally severe examinations.

The greatest diversity of opinion exists as to initiation fees. In some unions a large fee is collected, sometimes as high as $50 or $75, or more, on the ground that a man who pays a large sum to get in will be more likely to remain loyal; but other successful unions charge as little as $2 — the Cigarmakers' fee being only $3. The dues subsequently collected are usually about $1 a month, this low payment often including liberal benefits in case of sickness, strike or death. Many of the unions now use the stamp system in collecting their dues. A little book is presented each week or each month to the treasurer who pastes in and cancels the official stamps of the union for the amount of the dues paid.

The local unions are the units of the whole system of organized labor, but they are gathered into various great combinations. All the unions of garment workers, for instance, are united in a national organization called the United Garment Workers of America; similarly, the unions of printers make up the International Typographical Union, the locomotive engineers have an organization called the Grand International Brotherhood of Locomotive Engineers. Each of these organizations has a central office, the engineers in Cleveland, the garment workers in New York, and so on, and delegates from each local union meet yearly in convention. The officers, many of whom are paid salaries varying from $15 to $40 a week, are constantly traveling about, organizing new unions and, in case of a strike, offering advice and distributing pecuniary assistance. The national unions everywhere serve as clearing houses for information and advice, decide disputes between local unions, and by publishing periodicals devoted to the interests of the trade, keep union members informed about wages, hours, agitation, strikes, and so on, throughout the entire country.

The local and international unions are devoted each to its own trade, but they represent only a part of the labor movement and the part that is least known and least effective in its influence on public opinion and on legislation. In order to unite all these various trade unions that the solid influence of the entire labor movement may be brought to the accomplishment of certain definite ends, various other organizations have sprung up, unions of unions, representing every trade in a single city, or a single State, or in the nation. Nearly all the effective work in securing favorable laws, in boycotting, in settling difficulties between union and union, or employer and employee, has been the work of these federations and associations.

Nearly every large city has a central labor union, a body made up of delegates from all, or nearly all, the local unions of every trade. For instance, the Central Federated Union of New York City is an association of 116 local unions — butchers, carpenters, tailors, pie bakers, engineers, cigarmakers, printers, and so on. It meets once every month, is supported by dues of $2 a month from each affiliated union, and has for its purpose the discussion of methods for the general benefit of labor in the city. In some cases, the city labor union sits as a sort of court to decide disputes between local unions. For instance, the boiler-makers and the sheet-metal workers have a dispute regarding a job, and the central body decides that all jobs in iron of a given weight or heavier shall be done by the boiler-makers, all in lighter weights by the sheet-metal workers.

In the same way that federated unions are formed in cities, similar organizations have arisen in many States, the purpose being to influence legislation by the introduction and steady championship of bills favorable to the cause of labor, on the subject, for instance, of the eight-hour day, employers' liability in case of accident, the regulation of sweat-shop work, the organization of labor bureaus, and along similar lines.

But the greatest of all American organizations is the national federation — the American Federation of Labor — of which Samuel Gompers is president, with headquarters in Washington. A great combination of national and international unions, with yearly conventions of delegates, a staff of well-paid officers and organizers, an extensively circulated magazine, this federation includes nearly all the great national and international unions. (See LABOR, AMERICAN FEDERATION OF.) Its chief work consists in securing legislation in the United States Congress, in harmonizing and directing union effort in the struggles common to all union labor; in using its influence in securing the use of union label goods and in behalf of certain kinds of strikes, and in urging union labor everywhere to refuse to purchase goods manufactured or sold by "unfair" concerns. Every month a long list of these "unfair" houses appears in the "American Federationists" under the heading, "We Don't Patronize." Not infrequently it is able to prevent ill-advised strikes. The Federation has been instrumental in securing the passage of many laws which have greatly improved the condition of American workmen. A bare list of them is evidence enough of the remarkable rise in standards during the last

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25 years, of wages, comfort and independence among the thousands of workers.

The more skilled and intelligent the workmen, the less likely are they to desert, and the stronger the union. Thus, the various railroad men, the engineers and the firemen especially, have most excellent and compact organizations. The building trades — carpenters, bricklayers, plumbers, and so on, — the printing trades, the cigarmakers, the garment workers and many other classes possess good organizations.

Notwithstanding the detached locations of their works, and other difficulties, the coal miners have also been able to build up a strong union, and the iron, steel and tin workers are well organized. Some unions, such as the stereotypers and the photo-engravers, include practically every workman at their trades in America; other strong unions, like the cigarmakers, have 85 per cent. of the total number, the printers probably have over 90 per cent., and in most of the several building trades nearly every workman is a union man.

On the other hand, it is a difficult matter to organize certain trades, especially those requiring little skill. Attention is called however, to the improved conditions of the street railway employees, as shown in the 1904 Year Book, issued by President W. D. Mahon of the Amalgamated Association of Street and Electric Railway Employees of America. This book is a splendid contribution to the important and reliable record of trade-union achievement. It gives in detail the hours of labor and the wages prevailing in the various cities before the unions were formed and those prevailing now. Attention is also called to the fact that although the hod carriers and building laborers are unskilled workers, yet by their organization they have shortened their hours of labor, increased their wages and very materially improved their condition.

In order to minimize the difficulty of holding men in the unions in the face of defeat or against the temptation of higher wages or other advantages, many attractive schemes have been devised. For instance, many local unions, especially in the larger cities, are in effect clubs and employment agencies combined. Usually there is a more or less attractive lounging-room, where men may meet and play games or read books and newspapers. When a member loses a job, he goes first to the office of his local union, where he finds not only sympathy and advice, but the chance of another job. Some union offices have telephones, by means of which employers may instantly communicate with the secretary and secure the men they need.

But the union has still other means of holding its men, for it constitutes in many trades a great insurance and benefit system. A regular weekly payment of dues insures a man's family a benefit at his death, and in many instances it pays his doctor's bills, gives him relief when he is out of employment, and sometimes even enables him to secure loans of money to tide over a serious difficulty. Several great unions rest on their benefit systems as upon a rock, the members being willing to do almost anything rather than surrender this advantage.

In the Cigarmakers' Union, the insurance and benefit system has had its most complete development. During 25 years, ending 1904, the Cigarmakers' International Union, which now includes some 465 local unions, with about 35,000 members in the United States and Canada, paid out $6,416,520.78 in benefits to its members and their families. In 1904 the insurance and benefit disbursements were:

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| For death benefits | $151,752.93 |
| " sick benefits | 163,226.18 |
| " strike benefits | 32,388.88 |
| " out-of-work benefits | 29,872.50 |
| " traveling benefits | 58,728.71 |
| Total for year | $435,969.20 |

All these various benefits are obtained by members on the payment of regular dues of 30 cents a week (certain old men and partial invalids pay only 10, 15 or 20 cents and are not entitled to all benefits). In case of death, the family of a member receives from $50 to $550, and in the event of the death of his wife a member is paid a benefit. The benefits to men out on a strike were much larger in 1900 than usual, owing to a great strike in New York City. Instead of $117,000, paid in 1900, the sum in 1899 was only $12,000, in 1898 only $25,000, in 1897 only $12,000. Perhaps the most unique of all the benefit features is that of loans to traveling members. Any man who wishes to travel or to seek a job in another city may take a little book not unlike a bank-book, upon the presentation of which at any union in any city in America he may borrow as much as $20. As soon as he gets a job he pays back the money to the treasurer of the nearest local union. Secretary Brown of Union 144, New York City, stated that there were some 4,000 cigarmakers constantly traveling about the country, some of whom had been in every part of America working. Very little money is ever lost, for membership is too valuable to be trifled with. Once a member plays false, he is forever barred from membership in the union.

Before leaving the subject of benefits, especial note must be made of the home maintained by the International Typographical Union at Colorado Springs. Originally founded by a contribution from George W. Childs and A. J. Drexel, it is

known as the Childs-Drexel Home for Union Printers. It costs yearly for maintenance about $35,000, and it accommodates 100 patients. It is a source of pride to every union printer. "Big Six" of New York City also maintains a farm where its worn-out members may rest and recuperate.

Another influence that assists powerfully in holding the unions together is the trade journal published usually by the national union, but also by a few local unions, and by the American Federation of Labor. There are more than 250 of these periodicals, several being printed in two languages and some in three. As an example of the union journals, the "Locomotive Firemen's Magazine" may be mentioned, a publication beautifully printed and illustrated, containing nearly 200 pages of reading matter and pictures and 19 pages of advertising, besides much matter interesting to the "general reader."

In 1900 the money transactions of the Cigarmakers' Union exceeded $1,000,000, and though money came through the hands of hundreds of treasurers, the losses from errors or dishonesty were not $300. The money paid in by members was expended as follows:

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| For benefits | $410,705.20 |
| For salaries and committee expenses | 85,900.34 |
| For hall rent | 13,234.22 |
| For stationery and postage | 10,605.46 |
| For label agitation | 31,383.67 |
| For lawyers' fees and expenses in label cases | 1,991.70 |
| For assistance to unions during strikes, etc. | 152,785.42 |
| For tax to international union | 29,150.00 |
| For Galveston relief fund | 103.10 |
| For loss in defunct banks | 1,078.37 |
| Balance cash on hand Jan. 1, 1901 | $314,806.24 |

In its relations and conflicts with employers, the last few years have seen notable changes in the ways of unionism. Though the old method of the strike is still the accepted means of forcing an acquiescence to union demands, and though there have been more strikes during the past 10 years than ever before, yet the strike is more and more looked upon as a thing to be avoided, if possible, as a last resort, an appeal to brute force when diplomacy fails. This feeling is growing more pronounced among workmen every year, partly because of the changing attitude of employers. Once the labor union was looked on with contempt by the employer, but to-day, in most trades, the employer recognizes the union as a sober business reality, having often a salutary influence in steadying competition; and he is willing to meet it half way. As a result, associations of employers have sprung up, especially in the building trades—like the Building Trades Associations of various cities. These appoint committees to meet similar committees from the unions and to discuss wages, hours and almost any question that may arise between employer and employee.

In New York the employing printers have an association known as the Typothetæ, members of which hold regular meetings with a committee from the Typographical Union, a workman being chairman of the conference. More and more, also, unions enter into written agreements with employers for a certain set period—from one to three years—covering all questions of hours and wages. In some cases bonds are given to assure the literal fulfilment of the contract. "Big Six" has an agreement with the New York "Tribune," with a $5,000 bond forfeit on each side.

In proportion as the strike is discountenanced, and especially the violent strike, the unions are devising new and peaceful methods for accomplishing their purposes. They have invented the union label, the newest and perhaps the most effective instrument. Originally used some years ago by the cigarmakers of San Francisco in their conflict with Chinese labor, its application has spread till all trades unionism now looks to it as one of the most successful means of waging the struggle with combined capital. By agreement with the manufacturers, the labels copyrighted by the unions are attached to the various products of factory and mill, each box of cigars, for instance, each piano, each garment, each brick, and so on. A few unions, notably the famous "Big Six" Typographical Union of New York, with nearly 6,000 members, have imposed a fine for purchasing any but labeled goods, provided they can be had. Union label leagues and women's label leagues have sprung up in various parts of the country, and some of them already count a large membership.

The American Federation of Labor has, in convention, declared: "That the American Federation of Labor most firmly and unequivocally favors the independent use of the ballot by the trade unionists and workingmen, united regardless of party, that we may elect men from our own ranks to make new laws and administer them along the lines laid down in the legislative demand of the American Federation of Labor, and at the same time secure an impartial judiciary that will not govern us by arbitrary injunctions of the courts, nor act as the pliant tools of corporate wealth."

In reply to charges to the effect that trade unions were violating their agreements by the wholesale, the Executive Council, at its meeting at Washington in January, 1903, passed resolutions as follows, stating the position of organized labor upon this subject:

"It is widely and falsely charged by a hostile press and other opponents of organized labor that trade unions are frequently guilty of violating contracts en-

tered into with employers. There have been a few instances in which unions have unwisely violated agreements, but these are exceptions and not the rule, contracts being more frequently violated by the employer, and while we desire to give the strongest possible denial to the general accusations that agreements are not respected by organized labor, we do not wish to condone the exceptions.

"The attention of the Executive Council of the American Federation of Labor has been directed to one or two recent violations of contracts.

"We wish, in the strongest language possible, to express our regret that any organization of workingmen should fail to rigidly adhere to a contract entered into with employers of its members, and we believe it essential to urge upon trade unionists the absolute necessity of holding contracts between them and their employers inviolate."

The demands of the American Federation of Labor made in resolutions at its annual convention will give an idea of what American workmen are thinking and seeking:

1. Compulsory education.
2. The repeal of all conspiracy and penal laws affecting seamen and other workmen, incorporated in the Federal and State laws of the United States.
3. A legal work day of not more than eight hours.
4. Sanitary inspection of workshops, mines and homes.
5. Liability of employers for injury to health, body and life.
6. The abolition of the contract system in all public works.
7. The abolition of the sweating system.
8. The municipal ownership of street cars, waterworks and gas and electric plants for the distribution of heat, light and power.
9. The nationalization of telegraphs, telephones, railways and mines.
10. The abolition of the monopoly system of land holding and the substitution therefor of the title of occupancy only.
11. Direct legislation and the principle of referendum in all legislation.
12. The abolition of the monopoly privilege of issuing money and substituting therefor a system of direct issuance to and by the people.

*Revised by* SAMUEL GOMPERS.

**Union League Club,** a club organized in 1863, by members of the Republican party in New York, for social and political purposes. It was incorporated in 1865. Its object as stated at its foundation, which was during the Civil War, was "to promote, encourage and sustain by all proper means absolute and unqualified loyalty to the government of the United States; to discountenance and rebuke, by moral and social influences, all disloyalty to said government and every attempt against the integrity of the Nation"; and also to establish a library and art gallery for the collection of literature and works of art, and military trophies relating to the war. Union League Clubs were organized in many of the Northern cities.

**Union Theological Seminary,** an institution for theological education; founded in New York city by the Presbyterian Church in 1836. The word "Union" was added to its name for the sake of distinction by the Legislature when that body passed the act of its incorporation. During its early history the seminary suffered much inconvenience from lack of funds, but its endowment has increased till now it is about $2,400,000. There are several fine buildings, including Adams Chapel and the Morgan Library. The seminary has about 97,000 volumes in its library; average number of faculty, 22; average students, 165.

**Uniontown,** a borough and county-seat of Fayette co., Pa.; on the Baltimore and Ohio and the Pennsylvania railroads; 70 miles S. by S. E. of Pittsburg. Here are street railroads, electric lights, waterworks, churches, National and State banks, Soldier's Orphan Asylum, Madison College, and several daily and weekly newspapers. It has planing and flouring mills, glassworks, iron and steel plants, etc. Pop. (1890) 6,359; (1900) 7,344.

**Unit,** in arithmetic, the least whole number or one, represented by the figure 1. Numbers are collections of things of the same kind, each of which is a unit of the collection. Thus 20 feet is a collection of 20 equal spaces, each of which is equal to 1 foot; here 1 foot is the unit or base of the collection. In mathematics or physics, any known determinate quantity by the constant repetition of which any other quantity of the same kind is measured. It may be a length, a surface, a solid, a weight, a time, as the case may be. Abstract unit, the unit of numeration; the abstract unit 1 is the measure of the relation of equality of two numbers. It is the base of the system of natural numbers, and incidentally the base of all quantities. Decimal and duodecimal units, those in scales of numbers increasing or decreasing by 10 or 12 respectively. Dynamic units: Unit of force, a dyne; a force which, acting for one second on a mass of one gramme, gives to it a velocity of one centimeter per second. Unit of work done, a watt; the power developed when 44.25 foot pounds are done per minute = one 746th part of a horse-power. Fractional unit, the unit of a fraction. Thus in the fraction ¾ there is an assemblage of three units, each of which is one-fourth of the whole number. Integral unit, the unit 1; the unit of integral numbers. Specific gravity unit, for solids or liquids, one cubic foot of distilled water at 62° F. = 1; of air and gases, one cubic foot of atmospheric air at 62°. Unit of illumination, the light of a sperm candle burning 120 grains per hour. The standard for gas is that the flame, burning at the rate of five

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cubic feet per hour, shall give a light equal to the light of 14 sperm candles, each consuming at the rate of 120 grains per hour. Unit of measure, the unit of measure of any quantity is a quantity of the same kind, with which the quantity is compared. Unit of value, in England, a pound sterling, represented by a gold coin called a sovereign. In the United States, a gold dollar, weighing 25.8 grains, one-tenth of which is alloy. See UNITS, ELECTRICAL.

**Unitarian Church,** a communion comprising all who maintain that God exists in one Person only. The name Unitarian is applied specially to a small Christian sect whose distinguishing tenet is the Unity as opposed to the Trinity of the Godhead. In the more general sense the name of course includes the Jews and the Mohammedans. From the middle of the 2d century to the end of the 3d century there was a succession of eminent Christian teachers — Monarchians — who maintained, against the ecclesiastical doctrine of the Logos, the undivided unity of God. There are said to have been two classes of them — those who taught that Christ was God in such a sense that it was the Father who became man and those who held that Christ was in nature a mere man, but exalted above all other prophets by the superior measure of Divine wisdom with which he was endowed. The latter class was represented by Theodotus, Artemon, and especially Paul of Samosata. The grand theological struggle which followed in the 4th century between the Arians and the Athanasians may be regarded as but another phase of the Unitarian controversy.

It is not strange that in the great stir of thought which accompanied the Reformation some should have been found bold enough to question the Catholic doctrine of the Trinity; such there were even before the Socini, such as Hetzer, Bassen, Denck, Campanus, and Servetus. So widely, indeed, was the Unitarian doctrine diffused that it was thought necessary, in the first article of the Augsburg Confession, to condemn the modern Samosatans, who deny the personality of the Word and Spirit; and in 1527 Althamer published a work against "the modern Jews and Arians under a Christian name, who deny the deity of Christ." Under the influence of the elder Socinus Unitarianism gained many adherents in Venetia; but Poland and Transylvania became its principal strongholds. In Poland the nobility, protected by their class privileges, proved favorable; the Unitarian refugees from other countries found here a ready welcome; and in the reign of Sigismund II. (1548–1572) this party of reformers was strong enough to form itself into a separate church. Later Poland was the principal field of labor of the younger Socinus, and Unitarianism continued to flourish there till the middle of the 17th century, when, under John Casimir, it was extirpated by force. In Transylvania the Unitarians have succeeded in maintaining their existence, notwithstanding much opposition and persecution, from the Reformation to the present day. Led by George Blandrata and Francis Davidis (1565), large numbers, including the king himself, embraced the new opinions. But in 1572 the Unitarians were forbidden to make any attempts at propagandism, or even to print their religious books; after the incorporation of Transylvania with the Austrian empire (1690) they were robbed by the Roman Catholics of all their churches and church property, forbidden to build new churches without the permission of the emperor, and excluded from all government offices. On the accession of Joseph II. happier times returned. It was forbidden to seize their churches, and an indemnity was even paid them for the loss of their cathedral church of Klausenburg. The Unitarians of Transylvania number about 60,000. They have an organized system of church government, with a bishop at its head. They have three colleges — that of Klausenburg, with 24 professors and about an equal number of assistant professors and teachers; that of Thorda; and that of Szekely-Keresztur.

In England, as early as 1548, a priest named John Ashton was accused of Arianism, and escaped with his life only by recantation; and during the reigns of Edward VI., Mary, Elizabeth, and James I. a few suffered martyrdom on similar charges. In the reign of James I. continental Socinianism began to exercise considerable influence in England, and in 1665 Dr. Owen wrote that "the evil is at the door, that there is not a city, a town, scarce a village in England, wherein some of this poison is not poured forth." But it was in the last decade of the 17th century that the controversy on this subject was most active, and at this time were published the anonymous "Unitarian tracts." Hitherto the Unitarians, with the exceptions of the society formed in London by John Biddle, which did not survive its founder, had no organized existence. The first to use the term Unitarians (1687) was the heretical mercer and philanthropist, Thomas Firmin (1632–1697), a friend of Biddle's. The first preacher who described himself as Unitarian (1704) was apparently Thomas Emlyn (1663–1741), a Presbyterian who was imprisoned and fined on the charge of blasphemy. After the passing of the Toleration Act in 1689 the way was prepared for that gradual change by which the orthodoxy of the English Presbyterians passed into Unitarianism. It was at this time that most of

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the old Presbyterian chapels were founded; and the trusts being "open," ministers and people were left free to adopt whatever new opinions should approve themselves to their conscience. Thus the Unitarians may be said to be the successors of the 2,000 Presbyterian divines who in 1662 left the Church of England in consequence of their inability to comply conscientiously with the terms of the Act of Uniformity. The English Presbyterians were originally as orthodox as their Episcopal brethren; but having refused to commit themselves to any authoritative creed, they underwent a gradual change to Arian, and at length to Unitarian, views. Many preached such views without exciting attention or controversy, though till 1813, the law which made it blasphemy to speak against the Trinity was still in existence. During the latter half of the 18th century Dr. Priestly appeared as the champion of the humanitarian view of Christ's nature, and by the influence of his writings secured the more open advocacy of that doctrine. In 1773 Dr. Lindsey resigned his charge in the Church of England, and became pastor of the Unitarian congregation of Essex Street, London. In 1813 the Unitarians were placed by law fully on a par with other dissenters. The Unitarians of England and Wales are purely congregational in their church government, their only organ for combined action being the British and Foreign Unitarian Association, which holds its meetings annually in London. Their principal place of education is Manchester New College, Oxford, which is, however, an unsectarian institution. They have also a missionary college in Manchester, and the Presbyterian College, Carmarthen, educates Independent and Unitarian ministers.

Toward the close of the 18th century there was a certain amount of Arianism among the Moderates in the Church of Scotland. Unitarianism, as a distinct system, was preached at Montrose as early as 1783; and at the beginning of the 19th century some attempts were made to diffuse it by means of missionary efforts. There are now nine congregations in Scotland. That at Edinburgh was originally a branch from the Cameronians, but, having adopted the principle of free inquiry, its members gradually embraced Arian, and eventually (1812) humanitarian, views.

In Ireland the history of Unitarianism is intimately connected with that of Presbyterianism. It flourishes principally in the N. of the island, and the 10,000 Irish Unitarians are Presbyterians in fact as well as in name.

After 1740 Arian views of the person of Christ were pretty widely diffused among the New England clergy; and in 1787 took place the first secession from the Episcopal Church. By imperceptible degrees many of the New England churches glided into Unitarianism; but it was not till about 1815 that the name began to be much used. At that time the influence of Dr. Channing was thrown into the scale; and since then Massachusetts, and particularly Boston, has been the stronghold of Unitarianism in the United States. Harvard University is not a denominational institution; but it is at present in the hands of the Unitarians, and most of their ministers are educated either there or at the Meadville Theological School, Pa. Besides the Unitarians, properly so called, the Universalists and the Hicksite Quakers are understood to hold anti-Trinitarian sentiments, though they give no special prominence to the doctrine of Divine Unity. In polity the Unitarians are congregational, each church being independent in the control of its own affairs. There are National, State, and local conferences. The National conference, which meets biennially, declares in its constitution "its allegiance to the gospel of Jesus Christ," and its "desire to secure the largest unity of spirit and the widest practical coöperation" in Christian civilization. The Unitarian Church has its largest representation in Massachusetts, that State containing about one-half of its membership. In 1900 the reports of the denomination showed ministers, 550; churches, 459; and members, 71,000.

There are a few Unitarian churches in the principal colonies of Great Britain; and Unitarian sentiments, under the names of Liberal Christianity and Rationalism, are more or less widely diffused in France, Switzerland, Germany, and Holland.

The early Socinians assumed, as the fundamental principle of their theology, the sufficiency of Scripture, or rather, of the New Testament, which, they held, had superseded the Old. Christ was a true man, but conceived of the Holy Spirit; and on account of the divine power which He has received from the Father, and His exaltation as head over all things, He is to have worship offered to Him. The Holy Spirit is not a Person, but a divine influence. Man was created with a mortal nature, but, by the special gift of God, was endowed with a conditional immortality. The gift of immortality he forfeited by disobedience. The fall of Adam, being a single act, could not deprave his own nature, much less that of his posterity; and in the latter death was not a consequence of the fall. Thus the actual consequence of Adam's fall was not any radical corruption of human nature, but rather a moral deterioration. Man, after the fall, retained his free will, and the power of abstaining from sin if he so pleased. Christ's merits did not consist principally in His death, but in His life, His teachings, and His example. Nor was His death regarded as an atoning sacrifice, or as

having any vicarious efficacy whatever, but simply as a confirmation of God's will, and the seal of the new covenant. Not Christ's death, but His resurrection, is the central point of the Christian scheme. By this He confirmed His doctrine of immortality, and prepared for His ascension into heaven, where He now fills the office of our great High Priest. Predestination in this system means the decree of God, made before the foundation of the world, that they who believed and were obedient, should be saved, and that they who believed not and were disobedient should be damned. Justification takes place when God pardons our sins and gives us eternal life. The Socinians regarded the sacraments as simply external signs testifying to Christian faith. Hence they held infant baptism to be irrational as well as unscriptural, but thought that a custom so old and established should be tolerated.

With the early Socinians the English Unitarians have no very direct historical connection. They seem rather to have arrived at independent conclusions through their "rational" interpretation of Scripture, and their consistent rejection of human authority in matters of faith. The Unitarians of the present day, like almost all Christian sects, must be divided into two classes — a conservative and a progressive class — an old and a new school. The former adopt the old rule of sufficiency of Scripture, though with many such qualifications as the scientific criticism of the Bible has rendered indispensable. The most conservative Unitarians would not contend for the literal truth of the first chapter of Genesis, nor for the doctrine of verbal inspiration in any shape; the Bible is not, but it contains, the Word of God. They generally hold the simple humanity of Christ, and even reject the supernatural birth, thinking the portions of the gospels which record that event to be less authentic than those referring to the ministry, the death, and resurrection of Jesus. To the death of Christ they ascribe much the same kind of efficacy as the Socinians, regarding His teachings and example as the most essential part of His work and His death as an attestation to the truth of His mission, and a preliminary to His resurrection. What, however, chiefly distinguishes the Unitarians of this school from those of the new or progressive school is the place which they give to the miracles as supernatural sanctions of the truth of Christianity. Christ is an ambassador from heaven to earth; the miracles He wrought are His credentials; and the moral and religious truths which He taught are His message. It is not indeed denied that many or all of those truths might be learned from the light of nature, but they have received from Christianity a sanction which gives them a

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greater degree of certainty than they could otherwise possess. The Unitarians of the progressive school, on the other hand, have abandoned the philosophy of Locke for more spiritual modes of thought. So far from regarding man as entirely dependent on his reasoning powers for his knowledge of religion, they rather look upon him as standing in a living relationship with the one infinite source of all truth, and as having within his own nature the germs of the highest religious faith. Christianity, accordingly, they regard not as a message or a system of truth communicated and authenticated from without, but as the highest expression of the Divine in humanity — an expression not necessarily preternatural, but connected with the previous history of mankind by the natural laws of moral and spiritual development. To this view of Christianity the miracles are not felt to be essential as proofs; and the truth of the Gospel is thought to be quite unaffected by any judgment regarding them. The Unitarians, however, of this school, while, from their point of view, they regard the question of the miraculous as one of critical rather than religious interest, do not necessarily reject the miracles as historical facts, though, undoubtedly, a considerable and perhaps increasing number would agree with Theodore Parker and many of the German critics in rejecting them on the twofold ground that they are intrinsically incredible, and that the evidence for them is conflicting and uncertain. Generally speaking, the Unitarians of this school are disposed to regard with favor the freest criticism of the Bible. Holding that inspiration is a quality which is not peculiar to the Bible, but common to all the most elevated religious literature, and that it in no case implies immunity from error, they maintain that the Scriptures must be subjected to the same rules of criticism and interpretation as any other book, and that each book of Scripture is to be studied not as a collection of infallible oracles, but as a record of the mind of the age in which it was produced. In this light, however, and also as a record of the grandest religious movements of the world's history, they hold the Bible in the highest estimation. Such is a statement of the peculiarities of the two Unitarian schools in their extremest divergence from one another; in fact they merge into each other by imperceptible gradations.

It will of course be understood that the Unitarians of all shades of opinion are agreed in rejecting the entire orthodox scheme—including the doctrines of the Trinity, the vicarious atonement, the Deity of Christ, original sin, and everlasting punishment—as both unscriptural and irrational. They celebrate the Lord's Supper in their churches, not as a sacrament, but as

a service commemorative of Christ's death, and expressive of spiritual communion with Him. They also adhere generally to the rite of infant baptism, though there are a few Unitarian Baptist churches. Many object to the name Unitarian as one which might be held to imply a doctrinal bond of union, and to be, to that extent, inconsistent with unrestricted freedom of religious thought. When, at the meeting of the British and Foreign Unitarian Association in 1866, it was proposed to add to the rules a clause defining "Unitarian Christianity," the motion was almost unanimously rejected.

**United American Mechanics, Junior Order of,** an American beneficial organization founded in 1853; reported in 1909: State councils, 32; subordinate councils, 2,061; members, 201,897; benefits paid in the last fiscal year, $769,533; benefits paid since its organization, $7,000,000.

**United American Mechanics, Order of,** an American secret beneficial organization founded in 1845; reported in 1909: State councils, 14; subordinate councils, 525; members, 31,850; benefits paid in the last fiscal year, $121,979.

**United Brethren in Christ,** a denomination of evangelical Christians, founded through the labors of Rev. William Otterbein, a minister of the German Reformed Church. His meeting with Rev. Martin Boehm, a minister of the Mennonite Society, about 1766, marked the beginning of a widespread revival, in which he and Boehm were the recognized leaders. Preachers were licensed, the church was to a certain extent brought under system, conferences were held in 1789 and 1791, but the religious movement did not take the form of a Church till 1800, in which year an important conference was held at Peter Kemp's in Frederick co., Md. At this time the name of the denomination was definitely fixed, and Otterbein and Boehm were chosen bishops. Thereafter conferences were held yearly. The first General Conference was held in 1815, at which time the Confession of Faith was revised and regularly adopted. The Church was not the result of a schism, but the result of a revival of spiritual religion, and the adoption of such organization and methods as were necessary in the very nature of the case. The United Brethren have been confounded with the Moravians, with whom they have had no historical connection. They are also sometimes classed as Methodists, with whom they have at no time been connected. Otterbein and Boehm were both preaching the doctrine of a change of heart and the witness of the Spirit before there were Methodist societies in America. The government of the Church is composite, embracing Presbyterian, Congregational, and Episcopal features. A formal constitution was adopted in 1841. The highest legislative authority is vested in a General Conference, convening quadrennially, the Conference being composed of ministerial elders, elected by the entire membership. Other official bodies are the Annual and Quarterly Conferences, and on stations the official board. Lay representation in the Annual Conferences was authorized in 1877. Bishops were elected for a term of four years. Ministers are appointed to their charges by a stationing committee. They cannot serve the same charge for a longer term than three years without the special consent of the Annual Conference. The General Conference of 1885 provided for a commission to revise the constitution and Confession of Faith. The commission performed its work, and its results were, in 1888, ordered to be submitted to a vote of the entire Church for acceptance or rejection. The Church is Arminian in doctrine, very aggressive in work, and has been characterized by a strong reform spirit, standing from the first opposed to slavery, intemperance, and connection with secret societies. The Church insists on the observance of the sacraments, but leaves the mode of baptism to the conviction of the candidate. A personal religious experience is necessary to membership. Originating in Maryland, Pennsylvania, and Virginia, the Church extended first to the Middle States, and then principally to the West. There are now two bodies, with total churches, 3,900; ministers, 2,435; members, 296,050.

**United Greeks,** in Church history, a comprehensive name including all those who follow the Greek rite, and at the same time acknowledge the authority of the Pope. These are (1) the Melchites in the East, (2) the Ruthenians, (3) the Greek Catholics of Italy, whose clergy are allowed to marry when in minor orders, and continue in the married state after they are priests, but are forbidden under pain of deposition, to contract a second marriage. These Greeks, about 30,000 in number, have three seminaries, each with a resident Greek bishop to ordain the priests, but otherwise they are subject to the bishop in whose diocese they live. (4) The Catholics of the Greco-Roumaic rite in Hungary and Siebenbürgen, who number about 900,000, and form an ecclesiastical province. Their secular clergy are married.

**United Irishmen,** a secret society formed in 1791 by Theobald Wolfe Tone, having for its object the establishment of a republic in Ireland. Being arrested, and sentenced to death by a military commission, he committed suicide in Nov. 1798.

**United Presbyterian Church,** a religious body in Scotland, constituted in 1847 by the amalgamation of the "Secession"

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and "Relief" churches. The immediate cause of the formation of the Secession Church was the restoration in 1712 of the obnoxious Law of Patronage. Violent settlements, effected by the agency of dragoons, now became frequent, and greatly irritated the people; and finally, in 1730, the Assembly enacted that in future no reasons of dissent "against the determinations of church judicatures" should be entered on record. This attempt to gag the mouths of congregations was more than some could bear, and in October, 1732, the Rev. Ebenezer Erskine of Stirling, in a sermon delivered before the synod of Stirling, and Perth, denounced the recent legislation and spirit of the church. A committee appointed to consider the matter reported at the ensuing meeting of synod; and Erskine, after three days' "warm reasonings," was found deserving of censure. He immediately protested (as did also 12 other ministers and 2 elders), and appealed to the next General Assembly, which sustained the decision of the synod. Erskine left with the Assembly a written protest, which was also signed by William Wilson, minister of Perth; Alexander Moncrieff, minister of Abernathy; and James Fisher, minister of Kinclaven. The Assembly ordained that the four brethren should appear before the Commission in August and retract their protest, on pain of being suspended from the ministry. This they refused to do, and in consequence were declared no longer ministers of the church (November, 1733); whereon they handed in a final written protest, in which they declared that they were obliged to make a secession from them, and appealed to the first free, faithful, and reforming General Assembly of the Church of Scotland.

At first composed of only four ministers, the "Secession Church" rapidly began to gather strength. Little Christian societies were everywhere formed, which were gradually supplied with pastors either from the Establishment or from youths trained to the work of the ministry by Erskine and his friends. The "four brethren" drew up a testimony declaring their reasons for separation. What they sought was the vindication of what they held to be evangelical truth, much more than of the mere right of popular election. So much popular indignation was excited by their deposition that it was thought desirable by the majority of the Moderate party to make certain concessions to the Evangelicals, or Marrow party. The General Assembly of 1734 passed some measures distinctly favorable to the latter party, and empowered the synod of Perth and Stirling to remove the censures from the four brethren, and to restore them to their respective charges; but Erskine declined to be "reponed." In December, 1736, appeared the pamphlet commonly known as the "Judicial Testimony," which is a sort of survey of the whole ecclesiastical history of Scotland from the Reformation downward. In 1737 four other ministers joined the original four. In 1738 the commission of Assembly libelled the "eight brethren," and summoned them to appear before the Assembly of 1739, which they did; and after a year of grace the General Assembly of 1740 solemnly pronounced deposition, and the connection between Erskine and the church of his fathers was forever at an end.

In 1747 a rupture or "breach" took place in the new body on the question of the burgess oath, some affirming that this oath could not be taken by any consistent Seceder, and others insisting that it could, and that the question regarding it ought to be matter of mutual forbearance. The party in the new body on the question of the burgess oath formed the General Associate Synod, or, popularly, the Anti-burgher Synod; the party tolerating it, the Associate or Burgher Synod. Subsequently a second split occurred in each of these in regard to the province of the civil magistrate, and two other minor denominations were formed, the one assuming the designation of the Constitutional Associate Presbytery, or Old Light Anti-Burghers (1806), and the other that of the Original Burgher Presbytery, or Old Light Burghers (1799). After holding aloof from each other for more than 70 years, the Burghers and Anti-Burghers began to approximate once more, and finally, in 1820, the "New Light" sections were solemnly reunited. The Old Light sections, among whom Dr. McCrie was the most notable man, united in 1842 as the "Original Seceders," of which, after union of part with the Free Church, a remnant still forms a separate, but small communion. At the date of the "breach" the number of Secession congregations was 32; when the reunion took place it had increased to 262.

Henceforward the history of the Secession Church exhibits a course of uninterrupted prosperity. Ere long the Seceders came under the liberalizing influences of the newborn enthusiasm for foreign missions, and started stations in Canada, Jamaica, Trinidad, Calabar, and elsewhere; and in 1847 the Secession maintained more than 60 missionaries. Further the Secession Church began to assume an attitude more distinctly antagonistic to the Establishment. Though it has never formally avowed the voluntary principle, yet the fact that it has maintained itself *ab initio* by voluntary effort has had the effect of determining the great majority of the pastors and people to adopt this principle. The "Voluntary Controversy" (1829–1834) between leading divines of the Establishment and of the Secession served to strengthen the voluntaryism of

the Seceders, and brought them more closely into connection with the Relief Church, whose theoretical voluntaryism was perhaps still more pronounced. In the "Atonement Controversy" both bodies adhered to the liberal evangelical theology of the Marrow. But the Rev. James Morison, for what were thought his extreme views, was separated from the United Secession Church in 1841, and founded the Evangelical Union. The desire for union between the two denominations now became stronger than ever. Committees were appointed, and conferences held; and at length, on May 13, 1847, in Tanfield Hall, Edinburgh, the union of the Secession and Relief was formally accomplished, and the two churches formed themselves into one body under the designation of the United Presbyterian Church.

After the expulsion of Erskine and his friends from the Church of Scotland the assemblies became more determinedly "moderate" than ever. Never were forced settlements more frequent than about this period; but relief was felt to be a necessity, and relief came in the person of the Rev. Thomas Gillespie, minister of the parish of Carnock, near Dunfermline. In 1749 a presentation by the patron to the parish of Inverkeithing proved so extremely unpopular that the presbytery of Dunfermline refused to proceed with it. After various intermediate steps the Assembly of May, 1752, ordered the presbytery to induct the presentee on Thursday the 21st. The presbytery did not meet on Thursday — at least a quorum did not; and on Friday six ministers of the presbytery, including Gillespie, handed in a "representation," explaining why they could not obey the commands of the supreme court. They were warned by the moderator, and informed that if they remained obdurate one of them should be deposed. Gillespie was ultimately fixed on as the most suitable sacrifice, and without libel or any formal process whatever, he was arraigned, condemned, and deposed. Out of 158 members present, only 56 voted.

The Relief Church, it will thus be seen, was founded simply on an assertion of the right of congregations to elect their own ministers. In 1758 Thomas Boston, minister of Jedburgh, son of the great Boston, threw in his lot with Gillespie; in 1761 the congregation of Colinsburgh, in Fife did the same. The Relief had now gained a footing and steadily increased. At the union in 1847 they numbered 113 congregations, while the Secession numbered 384 congregations; so that the United Presbyterian Church commenced with 497 churches, and a membership estimated at more than 140,000.

The career of the United Presbyterian Church as a corporate body has been one of uninterrupted prosperity. In point of doctrine it adheres (like all the other Presbyterian churches of Scotland) to the Westminster Confession of Faith, and the Larger and Shorter Catechisms. But in 1879 a Declaration Act was adopted, setting forth more clearly and fully the view which the Synod takes of the teaching of Holy Scripture in reference to redemption, the divine decrees, man's depravity, salvation, the civil magistrate, the maintenance of the church, and liberty of opinion. Its form of church government is Presbyterian; but, unlike the Established and Free Churches, it has no intermediate courts between presbyteries and the supreme court, the Synod, really an assembly of the whole clergy, with one elder from each kirk-session. It has a Theological Hall and Library in Edinburgh, and a staff of professors. Though inferior in point of wealth to the Established and Free Churches, the United Presbyterian Church has honorably distinguished itself by its general liberality and occasional munificence. Negotiations for union between the United Presbyterian and Free Churches failed in 1863–1873, but were reopened in 1897. In the year 1875 about 100 congregations of the United Presbyterian Church situated in England were transferred to the "Presbyterian Church of England." But the mother church in Scotland counted in 1897 about 192,000 members.

**United Provinces,** the former British Indian provinces of Agra and Oudh; area, 107,164 square miles; pop. (1901) 47,691,782.

**United States Christian Commission,** an organization founded by the National Young Men's Christian Association to perform religious and charitable work among the Union forces during the Civil War. It was first suggested by Vincent Colyer, who immediately after the battle of Bull Run, in July, 1861, went to Washington to do Christian work in the hospitals and camps in and around that city. His suggestion that a society similar to the United States Sanitary Commission be organized by the Young Men's Christian Associations of the country was acted upon by a convention called for the purpose in New York city, Nov. 14, 1861. The United States Christian Commission was then formed, and George H. Stuart, of Philadelphia, was elected president. The work of the commission was mainly moral and religious; but while it circulated Bibles, books, leaflets, etc., in camps, ships, and hospitals, it also distributed much food, clothing, hospital stores, and delicacies. Like the Sanitary Commission, it followed in the wake of the great armies, and gave efficient aid to the army and navy chaplains in throwing Christian influence around soldiers and sailors. In its benevolent work, the commission expended over $6,000,000, most of which was

collected by the women in the different religious denominations.

**United States Coast Survey.** See COAST AND GEODETIC SURVEY, UNITED STATES.

**United States of America,** a Federal republic composed (1911) of the Federal District of Columbia, 48 States, the Territories of Hawaii and Porto Rico, the unorganized District of Alaska, the Panama Canal Zone, and the Philippine Islands, Guam, Tutuila, Wake, and other insular possessions, the continental portion chiefly occupying the temperate area of North America from lat. 24° 20′ to 49° N., and lon. 66° 48′ to 124° 32′ W.

*Boundary.*—The United States is bounded on the N. by British North America, the boundary line running through the Strait of Juan de Fuca to the S. of Vancouver's Island, but to the N. of the island of San Juan, striking the mainland at the 49th parallel and running along that parallel to the Lake of the Woods, and thence by a devious route through the Great Lakes and along the Laurentian water-shed to the St. John's and St. Croix rivers and Fundy Bay. The land boundary is a clearing 30 feet wide, with iron mile posts 4 feet high painted white. The E. and W. boundaries are formed by the Atlantic and Pacific Oceans respectively, the S. boundary by the Gulf of Mexico, the Rio Grande del Norte up to the 32d parallel, and a broken line drawn between the 31st and 33d parallels to the Pacific separating the United States from Mexico. These boundaries do not include Alaska. The ocean shore lines are as follows: North Atlantic coast, including bays, islands, etc., 6,150 miles; South Atlantic coast, 6,209; Mexican Gulf coast, 5,744; Pacific coast, 3,251—total, 21,354. The land, lake, and river boundary toward Canada is 3,700 miles, and the similar one toward Mexico, 2,105 miles; making the total ocean, land, lake, and river boundary, 11,075 miles. Excluding Alaska the greatest Continental extent E. and W. is 3,100 miles and N. and S., 1,780 miles.

*Area.*—The following table shows the surface areas in square miles of all continental and insular possessions, as reported by the General Land Office, June 30, 1910:

| State or Territory. | Land. | Water. | Total areas. |
|---|---|---|---|
| Alabama | 51,279 | 719 | 51,998 |
| Arizona | 113,840 | 116 | 113,956 |
| Arkansas | 52,525 | 810 | 53,335 |
| California | 156,092 | 2,205 | 158,297 |
| Colorado | 103,658 | 290 | 103,948 |
| Connecticut | 4,820 | 145 | 4,965 |
| Delaware | 1,965 | 405 | 2,370 |
| District of Columbia | 60 | 10 | 70 |
| Florida | 54,861 | 3,805 | 58,666 |
| Georgia | 58,725 | 540 | 59,265 |
| Idaho | 83,779 | 534 | 84,313 |
| Illinois | 56,002 | 663 | 56,665 |
| Indiana | 35,885 | 469 | 36,354 |
| Iowa | 55,586 | 561 | 56,147 |
| Kansas | 81,774 | 384 | 82,158 |
| Kentucky | 40,181 | 417 | 40,598 |
| Louisiana | 45,409 | 3,097 | 48,506 |
| Maine | 29,895 | 3,145 | 33,040 |
| Maryland | 9,941 | 2,386 | 12,327 |
| Massachusetts | 8,039 | 227 | 8,266 |
| Michigan | 57,480 | 500 | 57,980 |
| Minnesota | 80,858 | 3,824 | 84,682 |
| Mississippi | 46,362 | 503 | 46,865 |
| Missouri | 68,727 | 693 | 69,420 |
| Montana | 145,776 | 796 | 146,572 |
| Nebraska | 76,808 | 712 | 77,520 |
| Nevada | 109,821 | 869 | 110,690 |
| New Hampshire | 9,031 | 310 | 9,341 |
| New Jersey | 7,514 | 710 | 8,224 |
| New Mexico | 122,503 | 131 | 122,634 |
| New York | 47,654 | 1,550 | 49,204 |
| North Carolina | 48,740 | 3,686 | 52,426 |
| North Dakota | 70,183 | 654 | 70,837 |
| Ohio | 40,740 | 300 | 41,040 |
| Oklahoma | 69,414 | 643 | 70,057 |
| Oregon | 95,607 | 1,092 | 96,699 |
| Pennsylvania | 44,832 | 294 | 45,126 |
| Rhode Island | 1,067 | 181 | 1,248 |
| South Carolina | 30,495 | 494 | 30,989 |
| South Dakota | 76,868 | 747 | 77,615 |
| Tennessee | 41,687 | 335 | 42,022 |
| Texas | 262,398 | 3,498 | 265,896 |
| Utah | 82,184 | 2,806 | 84,990 |
| Vermont | 9,124 | 440 | 9,564 |
| Virginia | 40,262 | 2,365 | 42,627 |
| Washington | 66,836 | 2,291 | 69,127 |
| West Virginia | 24,022 | 148 | 24,170 |
| Wisconsin | 55,256 | 810 | 56,066 |
| Wyoming | 97,594 | 320 | 97,914 |
| | 2,974,159 | 52,630 | 3,026,789 |
| Alaska | ..... | ..... | 590,884 |
| Guam | ..... | ..... | 210 |
| Hawaii | ..... | ..... | 6,449 |
| Panama Canal strip | ..... | ..... | 474 |
| Philippine Islands | ..... | ..... | 115,026 |
| Porto Rico | ..... | ..... | 3,435 |
| Tutulia Group, Samoa | ..... | ..... | 77 |
| Total | ..... | ..... | 3,743,344 |

In addition to the above water areas, Illinois has 1,674 square miles of Lake Michigan; Indiana, 230 of Lake Michigan; Michigan, 16,653 of Lake Superior, 12,922 of Lake Michigan, 9,925 of Lake Huron, and 460 of Lakes St. Clair and Erie; Minnesota, 2,514 of Lake Superior; New York, 3,140 of Lakes Ontario and Erie; Ohio, 3,443 of Lake Erie; Pennsylvania, 891 of Lake Erie; and Wisconsin, 2,378 of Lake Superior and 7,500 of Lake Michigan. California, Oregon, and Texas claim jurisdiction over Pacific and Gulf waters for certain distances from their coast lines.

*Topography.*—The two great mountain systems of the United States are the Appalachians and the Rocky Mountains. The former extend from the mouth of the St. Lawrence to the mouth of the Mississippi—a distance of 1,300 miles—and at the S. bend inland, leaving the wide and rich seaboard of Virginia, the Carolinas, Georgia, Alabama, and Florida. This maritime region includes all the older States, and its inhabitants still amount to one-third of the whole. As far S. as the Hudson river it is hilly; thence, as far as the Alleghenies extend, its surface is divided between a plain and a mountain slope, the base of which appears to have been the shore of an ancient sea. The most fertile part of this slope is between Long Island and the Po-

United States of America

tomac. The coast to the Mississippi is sandy throughout; from Long Island to North Carolina it is marshy only close to the sea, but farther S. the seaward half of the plain is covered with swamps. The Appalachians form the watershed between the rivers draining into the Atlantic and the tributaries to the Mississippi, though some of the former may be said to rise on the inland side of the mountains, and to force a passage through them to the sea. The principal rivers falling into the Atlantic are the Penobscot, Kennebec, Merrimac, Connecticut, Hudson, Delaware, Susquehanna, Potomac, Rappahannock, James, Roanoke, Pedee, Santee, Savannah, and Altamaha. The Chattahoochee and the Flint river joining form the Appalachicola; the Alabama and Tombigbee, the Mobile; these drain into the Gulf of Mexico E. of the Mississippi.

The great central plains and prairies between the Appalachians and the Rocky Mountains are drained almost entirely by the Mississippi and its affluents, chief of which are the Ohio, Tennessee, Missouri, Arkansas, and Red river. The only other river of great importance flowing into the Gulf of Mexico is the great boundary river, the Rio Grande del Norte. The streams flowing N. are trifling, the principal being the Red river of the North, which flows into Lake Winnipeg. Almost the whole of the Mississippi basin consists of open, rolling prairies, while, on the other hand, almost all the country between the Appalachians and the Atlantic was originally more or less thickly wooded. Between the Rocky Mountains and the Pacific Alps, called Sierra Nevada, in California and Cascade Range further N., lies a rainless region, mostly S. of lat. 40° N., with an average elevation of 5,000 feet above the ocean, great part of it communicating, not with the sea, but draining into salt lakes and marshes. Except where irrigated, this plateau is utterly unproductive. To the N. it is drained by the Columbia, with its tributary the Snake river, which forces its way through the Sierras to the Pacific; while in the S. portion the Colorado and its affluents, after flowing through frightful cañons 3,000 to 5,000 feet below the surface of the plateau for some 600 miles, forms a delta at the head of the Gulf of California. The Great Cañon of the Colorado is more than 300 miles long. Between the Sierras and the ocean stretches the comparatively narrow but rich and beautiful sea-coast known as the Pacific Slope, drained by the Columbia, the Klamath, the Sacramento, and the San Joaquin, along with numerous smaller streams. The "Great Divide," or watershed, is in Montana and Wyoming, whence flow the Missouri, Columbia, and Colorado. In this wild region Congress set apart in February, 1872, the Yellowstone National Park, a tract 64 by 55 miles in extent (area, 3,575 miles) in the N. W. of Wyoming. The region, while mostly unfit for agriculture and mining, contains more natural marvels than can be found elsewhere. There are hot springs with their basins encrusted with calcareous spar, steam jets, geysers, mud volcanoes, waterfalls, caves with stalactites and stalagmites, eroded columns, statues, castles, cathedrals, etc., and a large lake swarming with fish. The valley of the Upper Yellowstone abounds in these wonders. Further details of the topography of the country will be found in the articles on the several States and Territories.

*Climate.*— The vast area of the United States necessarily exhibits a great variety of climate. New York has the winter of Copenhagen and the summer of Rome, the minimum range of the mercury being 5° in winter, and the maximum 98° in summer. The States bordering on Canada exceed both of these extremes, but throughout the Middle States, lat. 37°–41°, the climate is agreeable and often delightful throughout most of the year. The main peculiarity of the North American seasons is the almost total absence of spring. Mason and Dixon's Line, with its W. extension along the Ohio, Mississippi, and Missouri, has an historical interest, but is also of climatic importance in the geography of the cis-Missouri States. N. of it, sleighs are in frequent use during winter; S. of it, they are seen rarely. To to the N. the productions are those of the temperate zone, and the States were always free; to the S., the country becomes more and more tropical as one advances. From meridians 98° to 100° the climate is still variable from year to year, seasons of rain and plenty being followed by others in which drought is the forerunner of scarcity. But the planting of forest trees and the cultivation of the soil, at first by irrigation, has largely increased the amount of rainfall. Along the Pacific seaboard, especially in California, the climate resembles that of S. Europe. The isothermal lines, roughly stated, show a mean temperature of 72° for Florida, the Gulf Shores, and Arizona; of from 52° to 60° for S. of Pennsylvania, Virginia, the N. border of the Carolinas, Tennessee, Missouri, Kansas, S. of Utah and Nevada, and the greater part of California; from 44° to 52° for Massachusetts, New York, Michigan, Northern Illinois, Nebraska, Oregon and Washington; and from 36° to 44° for Maine, parts of New Hampshire and Vermont, Wisconsin, Minnesota, the whole crest of the Rocky Mountains, and parts of Oregon and California along the Sierras. The annual rainfall ranges from 56 to 64 inches in the S. of Florida and along the N. W. Pacific coast; 44 to 56 inches over the New England coast and the greater part of the Southern States, while in New York, Penn-

sylvania, Illinois, etc., it is 32-44 inches. In Texas, Indian Territory, Eastern Kansas and Nebraska, Dakota and Minnesota, and Western California, it is 20-32 inches, while in the tract between 98° and 118° it ranges from 18 to 4 inches. Malarial diseases prevail in the lowlands of most of the Southern States, as also in the new and marshy portions of the Western States below lat. 40° N. Consumption and chest diseases prevail in New England and in the Middle States. Minnesota, Colorado, California, Arkansas, Georgia, and Florida are favorite resorts for persons with weak lungs. On the whole, the climate of the United States may be called healthy, malarious and deadly spots being very few; while certain districts, especially of Florida, the central plains, and the Pacific coast, are among the most salubrious in the world.

*Geology.*—Geologically as well as geographically the United States is divided into two great sections by the Rocky Mountains, along whose whole extent, in a wide belt from N. to S., Cretaceous formations predominate, with occasional stretches of Carboniferous strata. Tertiary formations embrace almost the whole of the basin between the Rocky Mountains and the Pacific Alps, broken by igneous rocks in Washington Territory and Oregon, and Metamorphic strata along the Sierras; in the E. section Tertiary formations stretch along the coast from the Rio Grande almost to the Hudson. Metamorphic, igneous, and Devonian rocks prevail in New England, and along the shores of the Great Lakes the Middle Devonian or Old Red Sandstone. Older Palæozoic groups occur in Wisconsin, Ohio, and Tennessee, and run side by side with Metamorphic strata along the Appalachians, while much of the interior is occupied by Carboniferous deposits.

*Mineralogy.*—Anthracite coal occurs in New England, and the basins of Pennsylvania embrace about 472 square miles, and extend to a depth of from 60 to 100 feet. The Appalachian coal fields embrace an area of over 59,000 square miles, those of Michigan 6,700 square miles, those of Illinois 36,000 square miles, and those of Missouri 84,300 square miles. These great beds are said to be 20 times richer than all the coal fields of Europe put together. The ores of iron abound in the States, and include all known ores. The ore beds most largely worked are in Connecticut, New York, New Jersey, Pennsylvania, Ohio, Michigan, Tennessee, West Virginia, Alabama, Georgia, Wisconsin, Minnesota, the Dakotas, Utah, and California. Most of these beds are inexhaustible. Copper ore yielding 90-95 per cent. of pure metal is found in Northern Michigan, and Montana, and ores less rich in Vermont, Connecticut, North Carolina, Tennessee, and California; zinc in New Jersey, Pennsylvania, Arkansas, and California; lead ores (galena) in Minnesota, Iowa, Wyoming, Utah, the Dakotas, Nevada, etc.; tin in California and the Black Hills region, and a little elsewhere; quicksilver in California and Nevada. Gold and silver are widely distributed, 28 States and Territories reporting them; Alaska, California, Colorado, Nevada, Montana, Arizona, and Utah leading. Nevada, Colorado, Montana, Utah, Idaho, and Arizona yield more silver than gold.

The various mineral products of the United States broke all records for quantity and value during the calendar year 1907, and the remarkable development of the mining industry from 1880 to the close of 1907 is shown in the following table:

| Class. | 1880. | 1907. |
|---|---|---|
| Metallic | $185,649,163 | $903,802,244 |
| Non-metallic | 173,279,135 | 1,167,705,720 |
| Unspecified | 6,000,000 | 100,000 |
| Total | $364,928,298 | $2,071,607,964 |

Of all products in this phenomenal year, coal, in its two chief classes of anthracite and bituminous, held the first place, with a total production of 480,363,424 short tons, valued at $614,798,898; and in the 40 years then elapsed the percentage of the production of the United States in the world's total output rose from less than 15 per cent. to 39.43. The 1907 production exceeded that of Great Britain by over 180,392,000 short tons, or 60 per cent., and that of Germany by 253,590,000 short tons, or over 100 per cent. Next to coal, came in the order given, pig iron 25,781,361 long tons, valued at $529,958,000; copper, 868,996,491 pounds, valued at $173,799,300; clay products, valued at $158,942,369; and petroleum, 166,095,335 barrels, valued at $120,106,749.

*Flora and Fauna.*—The indigenous plants of the United States are estimated at about 5,000 species, California alone producing at least 2,500. The potato, the tobacco plant, and maize, now so familiar in Europe, have all been introduced from the United States or Mexico. The United States is especially rich in valuable timber trees, of which no less than 120 species, growing in sufficient quantities to be of commercial importance, attain a height of 100 feet and upwards. Of these 12 species reach an altitude of 200 feet, and 5 or 6 exceed 300 feet. Hickory, magnolia, liquid-amber, sassafras, and sequoia trees (to which species belong the giant trees of California), found only in a fossil state in the Old World, abound in the United States, as well as palmetto, tulip tree, cypress, cottonwood, live oak, and other oaks, and a number of trees more or less closely resembling the common species of Western Europe, to which the same

names have been given. So far as they have been described and classified, the Vertebrata are estimated at 2,249 species, the Mollusca at about 1,434 species, while an eminent entomologist considers that there are probably over 50,000 species of insects.

*Forestry.*—Our forests now cover over 550,000,000 acres, or about one-fourth of the entire area of the continental United States, and of this acreage about four-fifths are privately owned and contain at least that proportion of all standing timber. At the present time the rate of cutting is three times the annual growth. Of the forests publicly owned systematic forestry is now practiced on about 70 per cent., and on those privately owned less than 1 per cent. The Forest Service of the United States has charge of the administration and protection of the National Forest Reservations, which, in 1911, covered an area of over 195,000,000 acres in 20 States and Territories, and with two others in Alaska and one in Porto Rico, numbered over 150. The value of the public property administered by the Forest Service is estimated at over $2,000,000,000, and the conservation of the great areas of the forests by the Government is beginning to serve the purpose of their reservation, especially in the Western States.

*Reclamation Service.*—Much of the wonderful development of the agricultural industry in the last few years has been due to the great work of the National Government under the original irrigation Acts of Congress and more especially since the organization of the Reclamation Service in 1902. For irrigation purposes the country is divided into three sections, known as (1) the Arid States and Territories; (2) the Semi-Arid States and Territories; and (3) the Rice States; and these sections embrace 17 States and Territories. So far about 170,000 farms have been irrigated, comprising over 11,000,000 acres, at a construction cost of nearly $150,000,000. In 1911, President Taft submitted to Congress the report of a special board of army engineers to examine the various reclamation projects the Government had undertaken and to recommend the proportions in which an appropriation of $20,000,000 should be expended thereon.

*Public Lands.*—The following table shows the area of the public lands vacant and subject to entry and settlement, as reported by the General Land Office, July 1, 1910:

| State or Territory. | Area Unappropriated and Unreserved. | | |
|---|---|---|---|
| | Surveyed. | Unsurveyed. | Total. |
| | Acres. | Acres. | Acres. |
| Alabama ..... | 108,210 | ..... | 108,210 |
| Alaska ..... | ..... | 368,014,735 | 368,014,735 |
| Arizona ..... | 12,361,814 | 29,129,555 | 41,491,369 |
| Arkansas .... | 512,705 | ..... | 512,705 |
| California .... | 18,803,012 | 6,061,872 | 24,864,884 |

United States of America

| State or Territory. | Area Unappropriated and Unreserved | | |
|---|---|---|---|
| | Surveyed. | Unsurveyed. | Total. |
| | Acres. | Acres. | Acres. |
| Colorado .... | 19,432,009 | 2,294,183 | 21,726,192 |
| Florida ..... | 391,361 | 61,648 | 453,009 |
| Idaho ..... | 7,237,279 | 17,506,525 | 24,743,804 |
| Illinois ..... | ..... | ..... | ..... |
| Indiana ..... | ..... | ..... | ..... |
| Iowa ..... | ..... | ..... | ..... |
| Kansas ..... | 137,180 | ..... | 137,180 |
| Louisiana .... | 88,911 | ..... | 88,911 |
| Michigan .... | 107,890 | ..... | 107,890 |
| Minnesota ... | 1,516,302 | 47,000 | 1,563,302 |
| Mississippi .. | 47,058 | ..... | 47,058 |
| Missouri ..... | 2,510 | ..... | 2,510 |
| Montana ..... | 17,266,811 | 18,749,132 | 36,015,943 |
| Nebraska .... | 1,879,486 | ..... | 1,879,486 |
| Nevada ..... | 29,790,500 | 26,684,188 | 56,474,688 |
| New Mexico.. | 23,576,992 | 12,877,700 | 36,454,692 |
| North Dakota. | 1,410,225 | ..... | 1,410,225 |
| Ohio ..... | ..... | ..... | ..... |
| Oklahoma .... | 5,007 | ..... | 5,007 |
| Oregon ..... | 13,463,734 | 4,116,839 | 17,580,573 |
| South Dakota. | 4,375,864 | 186,940 | 4,562,804 |
| Utah ..... | 11,766,486 | 24,189,068 | 35,955,554 |
| Washington .. | 1,258,587 | 1,937,472 | 3,196,059 |
| Wisconsin ... | 14,460 | ..... | 14,460 |
| Wyoming .... | 31,914,779 | 2,660,380 | 34,575,159 |
| Total..... | 197,469,172 | 514,517,237 | 711,986,409 |

As a result of the National conservation of natural resources, over 294,000,000 acres have been withdrawn from settlement. About 193,000,000 acres have been converted into National forest reservations; 72,000,000 acres are valuable coal land; and 17,500,000 have been appropriated to the reclamation service (irrigation).

*Agriculture.*—The year 1910 was the most remarkable one in the history of the American agricultural industry. In his official report for that year Secretary Wilson, of the Department of Agriculture, said: "Nothing short of omniscience can grasp the value of the farm products of this year. At no time in the world's history has a country produced farm products within one year with a value reaching $8,926,000,000, the value of the agricultural products of this country for 1910." He also declared the corn crop to be a National asset in more than one sense, and its value "a sum sufficient to cancel the interest-bearing debt of the United States, buy all of the gold and silver mined in all of the countries of the earth in 1909, and still leave to the farmers a little pocket money."

The following table shows the production and value of the most important crops:

| Crop. | Quantity. | Value. |
|---|---|---|
| Corn ..... | 3,125,713,000 bu. | $1,523,768,000 |
| Winter wheat .... | 464,044,000 bu. | 413,575,000 |
| Spring wheat ..... | 231,399,000 bu. | 207,868,000 |
| Oats ..... | 1,126,765,000 bu. | 384,716,000 |
| Barley ..... | 162,227,000 bu. | 93,785,000 |
| Rye ..... | 33,039,000 bu. | 23,840,000 |
| Buckwheat ..... | 17,239,000 bu. | 11,321,000 |
| Flaxseed ..... | 14,116,000 bu. | 32,554,000 |
| Rice ..... | 24,510,000 bu. | 16,624,000 |
| Potatoes ..... | 338,811,000 bu. | 187,985,000 |
| Hay ..... | 60,978,000 tons | 747,769,000 |
| Tobacco ..... | 984,349,000 lbs. | 91,458,773 |
| Cotton ..... | 11,426,000 bales | 900,000,000 |

| SUMMARIES. | DATE OF CENSUS. | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1905[1] | 1900[1] | 1890 | 1880 | 1870 | 1860 | 1850 |
| Number of establishments .... | 216,262 | 512,726 | 355,415 | 253,852 | 252,148 | 140,433 | 123,025 |
| Capital ..... | $12,686,265,673 | $9,874,664,087 | $6,525,156,486 | $2,790,272,606 | $2,118,208,769 | $1,009,855,715 | $533,245,351 |
| Salaried officials, clerks, etc... | 519,751 | 397,730 | [2]461,009 | [3] | [3] | [3] | [3] |
| Salaries ..... | $574,761,231 | $404,837,591 | [2]$391,988,208 | [3] | [3] | [3] | [3] |
| Wage-earners, average number | 5,470,321 | 5,321,087 | 4,251,613 | 2,732,595 | 2,053,996 | 1,311,246 | 957,059 |
| Total wages ..... | $2,611,540,532 | $2,330,273,021 | $1,891,228,321 | $947,953,795 | $775,584,343 | $378,878,966 | $236,755,464 |
| Men, 16 years and over... | 4,244,538 | 4,120,716 | 3,327,042 | 2,019,035 | 1,615,598 | 1,040,349 | 731,137 |
| Wages ..... | $2,266,273,317 | $2,022,899,275 | $1,659,234,483 | [3] | [3] | [3] | [3] |
| Women, 16 years and over | 1,065,884 | 1,031,747 | 803,686 | 531,639 | 323,770 | 270,897 | 225,922 |
| Wages ..... | $317,279,008 | $281,705,586 | $215,367,976 | [3] | [3] | [3] | [3] |
| Children under 16 years.. | 159,899 | 168,624 | 120,885 | 181,921 | 114,628 | [3] | [3] |
| Wages ..... | $27,988,207 | $25,668,160 | $16,625,862 | [4] | [3] | [3] | [3] |
| Miscellaneous expenses ..... | $1,455,019,473 | $1,028,855,586 | $631,225,035 | [5] | [5] | [5] | [5] |
| Cost of materials used ..... | $8,503,949,756 | $7,360,954,597 | $5,162,044,076 | $3,396,823,549 | $2,488,427,242 | $1,031,605,092 | $555,123,822 |
| Value of products, custom work and repairing ..... | $14,802,147,087 | $13,040,013,638 | $9,372,437,283 | $5,369,579,191 | $4,232,325,442 | $1,885,861,676 | $1,019,106,616 |

NOTE.—The 1905 canvass was the first to be confined strictly to factory-system plants. 1. Totals are exclusive of government and Hawaiian plants. 2. Includes proprietors and firm members, with salaries. 3 and 5 not reported.

The following is a summary of the manufactures of the most important groups of articles, as reported by the census of 1905:



| GROUPS OF PRODUCTS. | Number of establishments. | Capital. | SALARIED OFFICIALS, CLERKS, ETC. | | WAGE-EARNERS. | | Cost of materials used. | Value of products, custom work and repairing. |
|---|---|---|---|---|---|---|---|---|
| | | | Number. | Salaries. | Average number. | Total wages. | | |
| Food ..... | 45,790 | $1,173,151,276 | 53,224 | $51,456,814 | 354,054 | $164,601,803 | $2,304,416,564 | $2,845,234,900 |
| Textiles ..... | 17,042 | 1,744,169,234 | 61,907 | 69,281,415 | 1,156,305 | 419,841,639 | 1,246,562,061 | 2,147,441,418 |
| Iron and steel ..... | 14,239 | 2,331,498,157 | 82,112 | 100,444,686 | 857,298 | 482,357,503 | 1,179,981,458 | 2,176,739,726 |
| Lumber ..... | 32,726 | 1,013,827,138 | 45,555 | 48,571,861 | 735,945 | 336,058,173 | 518,908,150 | 1,223,730,336 |
| Leather ..... | 4,945 | 440,777,194 | 17,233 | 18,372,722 | 255,368 | 116,694,140 | 471,112,921 | 705,747,470 |
| Paper and printing ..... | 30,787 | 798,758,312 | 80,009 | 81,808,311 | 350,205 | 185,547,791 | 308,269,655 | 857,112,256 |
| Liquors, etc. ..... | 6,381 | 659,547,620 | 12,647 | 21,421,353 | 68,340 | 45,146,285 | 139,854,147 | 501,266,605 |
| Chemicals ..... | 9,680 | 1,504,728,510 | 45,071 | 49,864,233 | 210,165 | 93,965,248 | 609,351,160 | 1,031,965,263 |
| Clay, glass, stone ..... | 10,775 | 553,846,682 | 18,768 | 21,555,724 | 285,365 | 148,471,903 | 123,124,392 | 391,230,422 |
| Other metals ..... | 6,310 | 598,340,758 | 19,471 | 24,854,596 | 211,706 | 117,599,837 | 644,367,583 | 922,262,456 |
| Tobacco ..... | 16,828 | 323,983,501 | 9,236 | 8,800,434 | 159,408 | 62,640,303 | 126,088,608 | 331,117,681 |
| Land vehicles ..... | 7,285 | 447,697,020 | 24,632 | 24,334,118 | 384,577 | 221,860,517 | 334,244,377 | 643,924,442 |
| Shipbuilding ..... | 1,097 | 121,623,700 | 2,480 | 3,339,741 | 50,754 | 29,241,087 | 37,463,179 | 82,769,239 |
| Miscellaneous ..... | 12,377 | 974,316,571 | 47,406 | 50,655,229 | 390,831 | 187,514,312 | 460,205,501 | 941,604,873 |

The live-stock on the farms and ranches of the country numbered over 199,000,000 head, representing a value of more than $5,000,000,000. The principal animals were:

| Class. | Number. | Value. |
|---|---|---|
| Horses | 21,040,000 | $2,276,363,000 |
| Mules | 4,123,000 | 494,095,000 |
| Dairy cows | 21,801,000 | 780,308,000 |
| Other cattle | 47,279,000 | 917,453,000 |
| Sheep | 57,216,000 | 233,664,000 |
| Swine | 47,782,000 | 436,003,000 |

*Manufacturers.*—The table on the preceding page presents a summary of the manufacturing interests of the United States in the period 1850-1905.

*Fisheries.*—The various fisheries employ about 7,000 vessels of all kinds, over 220,000 persons, and about $95,000,000 capital, and the value of the annual catch exceeds $62,000,000. During 1910 the United States Fish Commissioner broke all records of his office in the distribution of young fish and eggs, the amount being over 3,233,000,000. More than 60 per cent. of the quantity and nearly the same proportion of the value of the fishery products landed at Boston and Gloucester, Mass., by the American fishing fleet during the year were caught on fishing grounds lying off the coast of the United States. The Bureau of Fisheries maintains 35 fish hatcheries and 84 sub-hatcheries, auxiliaries, and egg-collecting stations, in 32 States and Territories.

*Commerce.*—The calendar year 1910 was a phenomenal one in American commerce. With the great total of $3,427,415,895, the foreign trade of the country was greater than that of any preceding year, and gave a balance in favor of the United States of $301,603,648. The value of all imports was $1,562,924,251; of all exports, $1,864,491,644. The entire foreign trade exceeded by about $80,000,000 that of the former high record year (1907). In the single item of cotton the exports reached $530,000,000 in value, exceeding by more than $60,000,000 the highest record ever before made.

The following table shows the trade with the principal countries during the calendar year 1910:

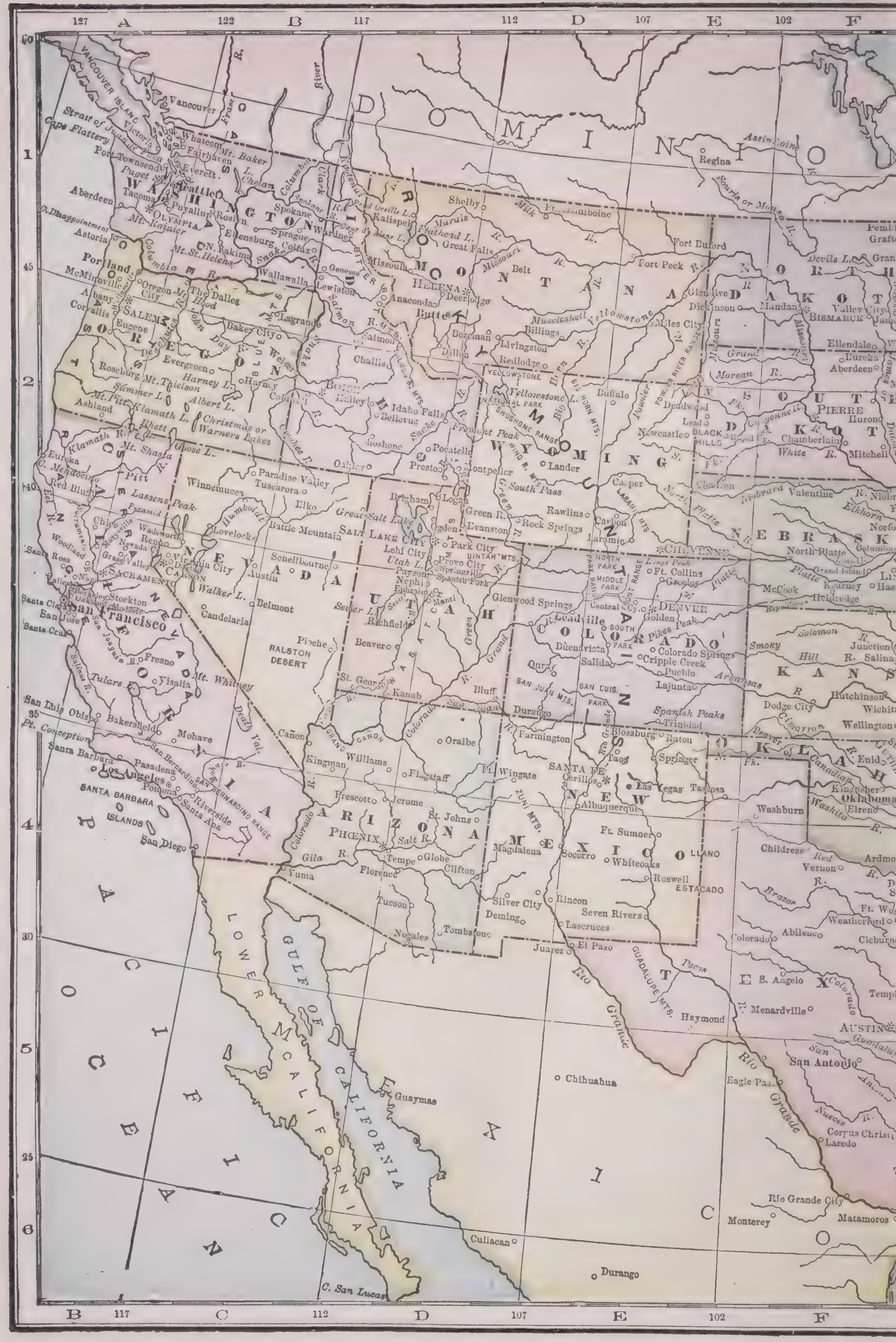
| Countries. | Imports. | Exports. |
|---|---|---|
| Argentina | $32,050,322 | $42,776,982 |
| Australia | 13,953,627 | 31,510,496 |
| Belgium | 37,559,056 | 38,910,722 |
| Brazil | 103,716,231 | 24,988,337 |
| Canada | 103,256,955 | 241,809,233 |
| Chinese Empire | 33,109,472 | 15,832,092 |
| Cuba | 127,827,395 | 57,783,617 |
| France | 121,810,225 | 115,709,548 |
| Germany | 166,536,719 | 258,307,490 |
| India, British | 43,428,214 | 7,638,981 |
| Italy | 49,296,827 | 52,697,405 |
| Japan | 73,763,695 | 26,566,178 |
| Mexico | 61,092,502 | 63,858,939 |
| Netherlands | 30,682,712 | 84,867,181 |
| Russia | 13,828,265 | 19,533,761 |
| United Kingdom | 270,889,409 | 550,626,404 |



| Countries. | Imports. | Exports. |
|---|---|---|
| GRAND DIVISIONS. | | |
| Europe | $790,154,694 | $1,192,695,728 |
| North America | 324,212,684 | 425,576,553 |
| South America | 189,466,428 | 100,303,616 |
| Asia and Oceania | 239,732,090 | 124,859,916 |
| Africa | 19,358,355 | 21,055,831 |
| Total | $1,562,924,251 | $1,864,491,644 |

The following is a summary of the groups of articles imported and exported in the fiscal year ending June 30, 1910, the details for the calendar year not having been reported at the time of writing:

| Groups. | Dollars. |
|---|---|
| Free of duty: Imports. | |
| Foodstuffs in crude condition, and food animals | 118,009,399 |
| Foodstuffs partly or wholly manufactured | 5,619,293 |
| Crude materials for use in manufacturing | 439,296,043 |
| Manufactures for further manufacturing | 122,618,842 |
| Manufactures ready for use | 63,026,617 |
| Miscellaneous | 7,591,202 |
| Total free of duty | 756,161,396 |
| Dutiable: | |
| Foodstuffs in crude condition and food animals | 30,078,875 |
| Foodstuffs partly or wholly manufactured | 171,545,229 |
| Crude materials for use in manufacturing | 128,851,687 |
| Manufactures for further manufacturing | 165,300,105 |
| Manufactures ready for use | 302,148,459 |
| Miscellaneous | 3,734,237 |
| Total dutiable | 801,658,592 |
| Free and dutiable: | |
| Foodstuffs in crude condition, and food animals | 148,088,274 |
| Foodstuff partly or wholly manufactured | 177,164,522 |
| Crude materials for use in manufacturing | 568,147,730 |
| Manufactures for further manufacturing | 287,918,947 |
| Manufactures ready for use | 365,175,076 |
| Miscellaneous | 11,325,439 |
| Total imports of merchandise | 1,557,819,988 |
| Per cent. of free | 48.54 |
| Duties collected from customs | 332,785,323 |
| Remaining in warehouse at end of the month | ..... |
| Exports. | |
| Domestic: | |
| Foodstuffs in crude condition, and food animals | 109,645,628 |
| Foodstuffs partly or wholly manufactured | 259,121,650 |
| Crude materials for use in manufacturing | 565,027,301 |
| Manufactures for further manufacturing | 267,447,844 |
| Manufactures ready for use | 500,861,219 |
| Miscellaneous | 7,980,356 |
| Total domestic | 1,710,083,998 |
| Foreign: | |
| Free of duty | 20,845,498 |
| Dutiable | 14,055,224 |
| Total foreign | 34,900,722 |
| Total exports | 1,744,984,720 |
| Excess of exports | 187,164,732 |
| Total imports and exports | 3,302,704,708 |


127
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45
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35
30
25
DOMINION
VANCOUVER ISLAND
Vancouver
Fraser R.
River
Strait of Juan de Fuca
Cape Flattery
Victoria
Whatcom
Fairhaven
Mt. Baker
Port Townsend
Everett
L. Chelan
Puget Sd.
Seattle
Aberdeen
Tacoma
Puyallup
Roslyn
OLYMPIA
Mt. Rainier
C. Disappointment
Astoria
WASHINGTON
Spokane
Sprague
Wardner
Colfax
Ellensburg
N. Yakima
Mt. St. Helens
Snake R.
Columbia R.
Clark
Kootenai
Pend Oreille L.
Kalispell
Cœur d' Alene L.
Wallawalla
Genesee
Lewiston
BITTER ROOT R. MTS.
Portland
McMinnville
Oregon City
Mt. Hood
The Dalles
Albany
SALEM
Corvallis
Eugene
John Day R.
Lagrande
Baker City
BLUE MTS.
Weiser
OREGON
Deschutes
Evergreen
Harney
Roseburg
Mt. Thielson
Harney L.
Summer L.
Albert L.
Mt. Pitt
Ashland
Klamath L.
Christmas or Warners Lakes
Rhett L.
Klamath R.
Mt. Shasta
Goose L.
Eureka
C. Mendocino
Pitt
Red Bluff
Lassens Peak
Pyramid L.
Eel R.
Sacramento
Chico
Marysville
Wadsworth
Reno
Nevada City
Grass Valley
Virginia City
CARSON
SACRAMENTO
Woodland
Santa Rosa
Napa
Vallejo
Berkeley
Oakland
Stockton
Modesto
Santa Clara
San Francisco
San Jose
Santa Cruz
San Joaquin R.
Fresno
Salinas R.
Tulare L.
Visalia
Mt. Whitney
SIERRA NEVADA
CALIFORNIA
San Luis Obispo
Bakersfield
Pt. Conception
Mohave
Mohave R.
Santa Barbara
Pasadena
Los Angeles
San Bernardino
Pomona
Riverside
Santa Ana
SAN BERNARDINO RANGE
SANTA BARBARA ISLANDS
San Diego
Death Val.
NEVADA
Winnemucca
Paradise Valley
Tuscarora
Elko
Humboldt
Lovelocks
Battle Mountain
Schellbourne
Austin
Walker L.
Belmont
Candelaria
Pioche
RALSTON DESERT
Cañon
Salmon R.
Salmon
Challis
BOISE
Hailey
Idaho Falls
Bellevue
Shoshone
Pocatello
Preston
Montpelier
Oakley
Owyhee R.
Caldwell
IDAHO
Missoula
HELENA
Deerlodge
Anaconda
Butte
Bozeman
Livingston
Dillon
Redlodge
Billings
Shelby
Milk R.
Ft. Assiniboine
Marias R.
Flathead L.
Great Falls
Missouri R.
Belt
MONTANA
Musselshell
Yellowstone R.
Fort Peck
Fort Buford
Glendive
Miles City
Regina
Assiniboine R.
Souris or Mouse R.
YELLOWSTONE NATIONAL PARK
Yellowstone L.
SHOSHONE RANGE
Fremont Peak
WIND R. MTS.
BIG HORN MTS.
Big Horn R.
Buffalo
Powder R.
POWDER RIVER RANGE
WYOMING
Lander
South Pass
Casper
LARAMIE MTS.
Rawlins
Carbon
Laramie
Green R.
Rock Springs
Evanston
CHEYENNE
North Platte R.
Brigham
Logan
Ogden
Great Salt Lake
SALT LAKE CITY
Park City
UINTAH MTS.
Lehi City
Provo City
Utah L.
Payson
Springville
Spanish Fork
Nephi
Ephraim
Manti
Sevier L.
Richfield
Beaver
St. George
Kanab
UTAH
WASATCH MTS.
Green R.
Grand R.
Bluff
NORTH PARK
MIDDLE PARK
SOUTH PARK
FRONT RANGE
Longs Peak
Ft. Collins
Greeley
Glenwood Springs
Central Cy.
DENVER
Golden
Leadville
COLORADO
Pikes Peak
Buenavista
Colorado Springs
Cripple Creek
Salida
Ouray
Pueblo
SAN JUAN MTS.
SAN LUIS PARK
Lajunta
Arkansas R.
Durango
Spanish Peaks
Trinidad
Blossburg
Raton
San Juan R.
Farmington
Rio Grande
Taos
Springer
SANTA FE
Cerillos
Las Vegas
Tascosa
Ft. Wingate
ZUNI MTS.
Albuquerque
NEW MEXICO
Ft. Sumner
Magdalena
Socorro
Whiteoaks
LLANO ESTACADO
Roswell
Silver City
Rincon
Deming
Seven Rivers
Lascruces
El Paso
Juarez
GRAND CAÑON
Colorado R.
Oraibe
Kingman
Williams
Flagstaff
Prescott
Jerome
ARIZONA
St. Johns
PHŒNIX
Salt R.
Gila R.
Tempe
Globe
Clifton
Yuma
Florence
Tucson
Nogales
Tombstone
NORTH DAKOTA
Devils L.
Mandan
BISMARCK
Dickinson
Valley City
Ellendale
Eureka
Aberdeen
Grand R.
Moreau R.
SOUTH DAKOTA
Deadwood
Lead
BLACK HILLS
Rapid Cy.
Newcastle
Cheyenne R.
PIERRE
Huron
Chamberlain
White R.
Mitchell
Chadron
Niobrara R.
Valentine
Elkhorn
NEBRASKA
North Platte
Platte
Grand Island
Kearney
McCook
Holdrege
Republican R.
Solomon R.
Smoky Hill R.
Junction
Salina
KANSAS
Hutchinson
Dodge City
Wichita
Wellington
Cimarron
Beaver
Enid
Canadian
Kingfisher
Oklahoma
Elreno
Washita
OKLAHOMA
Washburn
Childress
Red R.
Vernon
Brazos
Ft. Worth
Weatherford
Colorado
Abilene
Cleburne
TEXAS
S. Angelo
Menardville
Pecos R.
GUADALUPE MTS.
Haymond
AUSTIN
Guadalupe
San Antonio
Eagle Pass
Nueces R.
Corpus Christi
Laredo
Rio Grande City
Monterey
Matamoros
MEXICO
Chihuahua
Guaymas
Culiacan
Durango
LOWER CALIFORNIA
GULF OF CALIFORNIA
C. San Lucas
PACIFIC OCEAN

G 92 H 87 J 82 K 77 L 72 M 67
1 2 3 4 5 6
CANADA
Lake Winnipeg
Lake Nipigon
Lake of the Woods
Rainy L.
Rainy R.
Red L.
ISLE ROYALE
LAKE SUPERIOR
St. Marys River and Canal
Ottawa R.
St. Lawrence R.
Quebec
Montreal
Ottawa
OTTAWA
Lake Champlain
Georgian Bay
Strait of Mackinac
Duluth
Bayfield
Ironwood
Marquette
Ishpeming
Sault Ste. Marie
Escanaba
Cheboygan
Alpena
Traverse City
Manistee
Marinette
Superior
Ashland
Brainerd
Fergus Falls
Little Falls
St. Cloud
Anoka
Stillwater
Minneapolis
St. Paul
Worcester
Wausau
Appleton
Oshkosh
Green Bay
Fond du Lac
Sheboygan
Winona
Red Wing
Owatonna
Rochester
Austin
Albert Lea
Mason City
Ft. Dodge
Waterloo
Dubuque
Rockford
Freeport
Elgin
Chicago
Milwaukee
Racine
Kenosha
Grand Rapids
Battle Creek
Kalamazoo
Michigan City
Gosben
Ann Arbor
Adrian
Toledo
Detroit
Lansing
Flint
Port Huron
Saginaw
Bay City
West Bay City
Sarinaw
Muskegon
Owosso
Lake St. Clair
Lake Michigan
Lake Huron
Lake Erie
Lake Ontario
Toronto
Hamilton
Niagara Falls
Lockport
Rochester
Oswego
Cohoes
Watertown
Utica
Rome
Syracuse
Schenectady
ALBANY
Troy
Saratoga
ADIRONDACK MTS.
CATSKILL MTS.
Springfield
HARTFORD
Binghamton
Ithaca
Elmira
Buffalo
Erie
Bradford
Olean
Williamsport
Wilkesbarre
Scranton
Pottsville
Reading
Lebanon
Easton
Trenton
Jersey City
Newark
New York
New York Bay
Long Island Sd.
Montauk Pt.
Boston
Lowell
Worcester
Providence
Newport
Cape Cod
Monomoy Pt.
NANTUCKET I.
MARTHAS VINEYARD
Portland
Biddeford
Portsmouth
Concord
Manchester
Lewiston
Augusta
Bangor
Mt. Katahdin
Caribou
St. John R.
Penobscot R.
Kennebec R.
Androscoggin R.
Mt. Washington
Auburn
Rockland
MAINE
NEW HAMPSHIRE
VERMONT
GREEN MTS.
WHITE MTS.
MASSACHUSETTS
CONNECTICUT
RHODE ISLAND
Cleveland
Youngstown
Akron
Canton
Tiffin
Sandusky
Mansfield
Findlay
Fort Wayne
Toledo
Michigan City
Gosben
Elkhart
South Bend
Kankakee
Ottawa
Rock I.
Davenport
Clinton
Cedar R.
Iowa R.
Des Moines R.
Des Moines
Council Bluffs
Omaha
Nebraska City
Atlantic
Oskaloosa
Ottumwa
Muscatine
Burlington
Galesburg
Streator
Peoria
Logansport
Fort Madison
Keokuk
Quincy
Hannibal
Trenton
Chillicothe
Joseph
Moberly
Kansas City
Sedalia
JEFFERSON CITY
Osage R.
Ottawa
Scott
Nevada
Carthage
Springfield
Joplin
West Plains
Eureka Springs
Fayetteville
White R.
Van Buren
Ft. Smith
ARKANSAS
LITTLE ROCK
Hot Springs
Arkadelphia
Pine Bluff
Texarkana
Bonham
Marshall
Tyler
Palestine
Sabine R.
Shreveport
Monroe
Natchitoches
Alexandria
Opelousas
Lake Charles
Beaumont
New Iberia
Galveston Bay
Galveston
Morgan City
Atchafalaya R.
Red R.
Ouachita R.
Washita R.
Trinity R.
Brazos R.
Colorado R.
Pecos R.
Rio Grande
Cape Girardeau
Cairo
Paducah
Bowling Green
Louisville
Owensboro
Evansville
New Albany
Jeffersonville
Madison
Vincennes
Terre Haute
Lafayette
Crawfordsville
Danville
Lincoln
Springfield
Decatur
Alton
East St. Louis
St. Charles
St. Louis
Missouri R.
Mississippi R.
Illinois R.
Wabash R.
Kaskaskia R.
Big Muddy R.
Meramec R.
Chippewa R.
Black R.
Yazoo R.
Pearl R.
Big Black R.
Tombigbee R.
Alabama R.
Coosa R.
Tallapoosa R.
Chattahoochee R.
Flint R.
Ocmulgee R.
Oconee R.
Ogeechee R.
Savannah R.
Pee Dee R.
Santee R.
Cape Fear
Roanoke R.
James R.
Potomac R.
Susquehanna R.
Delaware R.
Delaware Bay
Cape May
Chesapeake Bay
Hampton Roads
Norfolk
Portsmouth
Newport News
Petersburg
Richmond
Lynchburg
Charlottesville
Fredericksburg
Alexandria
Washington
Annapolis
Baltimore
Wilmington
Philadelphia
Harrisburg
Pittsburg
Allegheny
Altoona
Johnstown
Cumberland
Hagerstown
Chambersburg
Gettysburg
Frederick
Hanover
York
Lancaster
Carlisle
Shamokin
Williamsport
Elmira
Corning
Jamestown
Meadville
Erie
Oil City
Franklin
Warren
Ashtabula
Conneaut
Cleveland
Akron
Canton
Youngstown
Steubenville
Wheeling
Clarksburg
Parkersburg
Point Pleasant
Huntington
Ashland
Portsmouth
Maysville
Newport
Covington
Cincinnati
Dayton
Springfield
Zanesville
Cambridge
Marietta
Athens
Pomeroy
Middleport
Gallipolis
Ironton
Lawrenceburg
Aurora
Madison
Jeffersonville
New Albany
Louisville
Lexington
Frankfort
Paris
Winchester
Huntington
Charleston
Logan
Beckley
Princeton
Bluefield
Pocahontas
Bristol
Johnson City
Knoxville
Cumberland Mts.
Cumberland R.
Tennessee R.
Kentucky R.
Big Sandy R.
Kanawha R.
New R.
Holston R.
Clinch R.
Powell R.
Nashville
Murfreesboro
Union City
Jackson
Columbia
Memphis
Florence
Huntsville
New Decatur
Chattanooga
Cleveland
Dalton
Rome
Lookout Mt.
Gadsden
Anniston
Birmingham
Bessemer
Tuscaloosa
Aberdeen
Okolona
Corinth
Holly Springs
Grenada
Westpoint
Greenville
Columbus
Yazoo City
Vicksburg
Meridian
JACKSON
Brookhaven
Natchez
Selma
Montgomery
Opelika
Eufaula
Greenville
Troy
Tuskegee
Macon
Columbus
Americus
Albany
Thomasville
Waycross
Brunswick
Jasper
Milton
Mobile
Pensacola
Biloxi
Bay St. Louis
New Orleans
Lake Pontchartrain
Lake Borgne
Mississippi R.
Mouths of the Mississippi River
Mobile Bay
Apalachicola
Apalachicola R.
Apalachee Bay
C. San Blas
TALLAHASSEE
Tampa Bay
Tampa
Lake City
Palatka
Gainesville
Ocala
Orlando
Kissimmee
Bartow
Sanford
Daytona
St. Augustine
Jacksonville
St. Marys R.
Fernandina
St. Johns R.
Indian R.
C. Canaveral
Lake Okeechobee
The Everglades
Miami
C. Romano
C. Sable
Florida Bay
Key West
FLORIDA KEYS
Florida Strait
BAHAMA I.
West Palmbeach
BAHAMA
ISLANDS
ELEUTHERA I.
NEW PROVIDENCE
NASSAU
WATLING I.
ANDROS I.
C. Lookout
C. Hatteras
Cape Fear
Pedee R.
Georgetown
Charleston
Beaufort
Savannah
Summerville
Aiken
Augusta
Milledgeville
Griffin
ATLANTA
Gainesville
Athens
Spartanburg
Greenville
Greenwood
Newberry
Columbia
SOUTH CAROLINA
Florence
Sumter
Wilmington
Raleigh
Goldsboro
Salisbury
Greensboro
Winston-Salem
Durham
Washington
Newbern
Asheville
Charlotte
Fayetteville
NORTH CAROLINA
Cape Fear R.
Yadkin R.
Catawba R.
Broad R.
Saluda R.
Savannah R.
Oconee R.
Ocmulgee R.
Flint R.
Chattahoochee R.
Alabama R.
Coosa R.
Tallapoosa R.
Tombigbee R.
Pearl R.
Big Black R.
Yazoo R.
Tennessee R.
Cumberland R.
Kentucky R.
Big Sandy R.
Kanawha R.
New R.
Holston R.
Clinch R.
Powell R.
Roanoke R.
James R.
Potomac R.
Susquehanna R.
Delaware R.
Lake Erie
Lake Ontario
Lake Champlain
Lake Michigan
Lake Huron
Lake St. Clair
Lake Superior
Lake Nipigon
Lake of the Woods
Rainy L.
Rainy R.
Red L.
Winnipeg
Lake Winnipeg
Lake Winnipegosis
Lake Manitoba
Lake Winnipeg
Lake of the Woods
Rainy L.
Rainy R.
Red L.
Lake Nipigon
Lake Superior
Lake Michigan
Lake Huron
Lake St. Clair
Lake Erie
Lake Ontario
Lake Champlain
Lake Winnipeg
Lake of the Woods
Rainy L.
Rainy R.
Red L.
Lake Nipigon
Lake Superior
Lake Michigan
Lake Huron
Lake St. Clair
Lake Erie
Lake Ontario
Lake Champlain
UNITED STATES
GULF OF MEXICO
ATLANTIC OCEAN
CUBA
Scale of Miles
0 50 100 200 300 400
Canals

United States of America

| | Dollars. |
|---|---|
| Gold—Imports | 43,339,905 |
| Exports | 118,563,215 |
| Silver—Imports | 45,217,194 |
| Exports | 55,286,861 |

*Railroads.*—The remarkable development of the railroad systems of the United States is set forth in the following summary of mileage from the statistical report of the Interstate Commerce Commission for the fiscal year ending June 30, 1909:

| State or Territory. | Official. | Unofficial. | Total. |
|---|---|---|---|
| Alabama | 4,976.74 | 188.50 | 5,165.24 |
| Arizona | 1,994.36 | ..... | 1,994.36 |
| Arkansas | 5,134.02 | 102.50 | 5,236.52 |
| California | 7,379.38 | 149.48 | 7,528.86 |
| Colorado | 5,408.68 | 45.75 | 5,454.43 |
| Connecticut | 1,004.74 | ..... | 1,004.74 |
| Delaware | 336.64 | ..... | 336.64 |
| District of Columbia | 35.27 | ..... | 35.27 |
| Florida | 4,173.05 | 81.00 | 4,254.05 |
| Georgia | 6,890.09 | 49.50 | 6,939.59 |
| Idaho | 2,117.30 | 17.00 | 2,134.30 |
| Illinois | 11,834.22 | 16.69 | 11,850.91 |
| Indiana | 7,382.55 | ..... | 7,382.55 |
| Iowa | 9,747.41 | 4.53 | 9,751.94 |
| Kansas | 8,947.09 | 5.50 | 8,952.59 |
| Kentucky | 3,420.93 | 46.50 | 3,467.43 |
| Louisiana | 5,315.26 | 141.00 | 5,456.26 |
| Maine | 2,105.95 | 59.71 | 2,165.66 |
| Maryland | 1,409.01 | 36.20 | 1,445.21 |
| Massachusetts | 2,101.24 | 14.86 | 2,116.10 |
| Michigan | 9,051.55 | 7.30 | 9,058.85 |
| Minnesota | 8,530.30 | 38.00 | 8,568.30 |
| Mississippi | 4,349.64 | 48.00 | 4,397.64 |
| Missouri | 8,031.97 | 13.50 | 8,045.47 |
| Montana | 4,099.84 | 38.26 | 4,138.10 |
| Nebraska | 6,015.02 | ..... | 6,015.02 |
| Nevada | 2,121.23 | 17.00 | 2,138.23 |
| New Hampshire | 1,248.86 | ..... | 1,248.86 |
| New Jersey | 2,250.79 | 5.00 | 2,255.79 |
| New Mexico | 3,003.96 | ..... | 3,003.96 |
| New York | 8,420.78 | 27.40 | 8,448.18 |
| North Carolina | 4,761.14 | 99.10 | 4,860.24 |
| North Dakota | 4,200.30 | ..... | 4,200.30 |
| Ohio | 8,960.80 | 118.39 | 9,079.19 |
| Oklahoma | 5,769.06 | 16.00 | 5,785.06 |
| Oregon | 2,149.55 | 10.00 | 2,159.55 |
| Pennsylvania | 11,140.70 | 65.19 | 11,205.89 |
| Rhode Island | 212.54 | ..... | 212.54 |
| South Carolina | 3,375.37 | 22.00 | 3,397.37 |
| South Dakota | 3,947.65 | ..... | 3,947.65 |
| Tennessee | 3,678.63 | 82.40 | 3,761.03 |
| Texas | 13,458.68 | 61.96 | 13,520.64 |
| Utah | 1,956.84 | ..... | 1,956.84 |
| Vermont | 1,067.42 | 20.85 | 1,088.27 |
| Virginia | 4,411.54 | 75.10 | 4,486.64 |
| Washington | 4,633.63 | 17.00 | 4,650.63 |
| West Virginia | 3,390.17 | 112.23 | 3,502.40 |
| Wisconsin | 7,274.10 | 170.73 | 7,444.83 |
| Wyoming | 1,573.41 | 45.00 | 1,618.41 |
| Grand total in U. S. 1909 | 234,799.40 | 2,069.13 | *236,868.53 |

*Exclusive of 302.92 miles in Alaska and 149.34 miles in Hawaii.

The capital stock of all companies (1909) was $8,030,680,963; bonded debt, $9,911,601,612; floating debt, $269,887,378; all liabilities, $19,457,265,329; and total assets, $20,246,567,609. The earnings from passengers were $578,243,601; from freight, $1,720,863,413; from miscellaneous sources, $214,105,749; total traffic revenue, $2,513,212,763; and net traffic earnings, $852,153,280.

The various roads employed 60,601 locomotive engines, 36,245 passenger cars, 2,180,324 freight cars, and 13,449 baggage, mail, and other cars. Interest paid by corporations on bonds and other debts aggregated $352,674,922, and dividends paid on stock, $265,162,298.

*Canals.*—The principal canals in the United States or connected with it, that were open to commercial traffic in 1910, are shown in detail in the subjoined statement:

| Canals. | Cost of Construction.* | When Completed | Len'h miles. |
|---|---|---|---|
| Albemarle and Chesap'ke | $1,641,363 | 1860 | 44 |
| Augusta | 1,500,000 | 1847 | 9 |
| Black River | 3,581,954 | 1849 | 35 |
| †Cayuga and Seneca | 2,232,632 | 1839 | 25 |
| ‡Champlain | 4,044,000 | 1822 | 81 |
| Chesapeake and Delaw'e | 3,730,230 | 1829 | 14 |
| Chesapeake and Ohio | 11,290,327 | 1850 | 184 |
| Companys | 90,000 | 1847 | 22 |
| Delaware and Raritan | 4,888,749 | 1838 | 66 |
| Delaware Division | 2,433,350 | 1830 | 60 |
| Des Moines Rapids | 4,582,009 | 1877 | 7½ |
| ‡Erie | 52,540,800 | 1826 | 387 |
| Fairfield | ..... | .... | 4½ |
| Galveston and Brazos | 340,000 | 1851 | 38 |
| Hocking | 975,481 | 1843 | 42 |
| Illinois and Michigan | 7,357,787 | 1848 | 102 |
| Illinois and Mississippi | 7,250,000 | 1895 | 75 |
| Lake Drummond | 2,800,000 | 1899 | 22 |
| Lehigh Coal and Navigation Co. | 4,455,000 | 1821 | 108 |
| Louisville and Portland. | 5,578,631 | 1872 | 2½ |
| Miami and Erie | 8,062,680 | 1835 | 274 |
| Morris (may be aband'd) | 6,000,000 | 1836 | 103 |
| Muscle Shoals and Elk River Shoals | 3,156,919 | 1889 | 16 |
| Newberne and Beaufort. | ..... | .... | 3 |
| Ogeechee | 407,810 | 1840 | 16 |
| Ohio | 4,695,204 | 1835 | 317 |
| ‡Oswego | 5,239,526 | 1828 | 38 |
| Pennsylvania | 7,731,750 | 1839 | 193 |
| Portage Lake and Lake Superior | 528,892 | 1873 | 25 |
| Port Arthur | ..... | 1899 | 7 |
| Santa Fé | 70,000 | 1880 | 10 |
| Sault Ste. Marie (ship canal) | 4,000,000 | 1895 | 3 |
| Schuylkill Navigation Co. | 12,461,600 | 1826 | 108 |
| Sturgeon Bay and Lake Michigan | 99,661 | 1881 | 1¼ |
| St. Mary's Falls | 7,909,667 | 1896 | 1⅓ |
| Susqueh'a and Tidewater | 4,931,345 | 1840 | 45 |
| Walhonding | 607.269 | 1843 | 25 |
| Welland (ship canal) | 26,080,366 | 1833 | 26¾ |

*And improvements.

Cape Cod canal (sea level ship canal) about 12 miles long, to connect Massachusetts Bay and Buzzard's Bay, under construction, to be completed Jan. 1, 1913.

Beaufort canal (Beaufort, N. C., to Neuse river) under construction.

The Harlem river ship canal, connecting the Hudson river and Long Island Sound, by way of Spuyten Duyvil creek and Harlem river, was opened for traffic on June 17, 1895, and cost about $2,700,000.

†The Cayuga and Seneca canal will be enlarged to pass barges of the same capacity as the improved Erie canal at a cost estimated at $7,000,000.

‡The Erie, Oswego and Champlain canals were being enlarged by the State of New York to a depth of 12 feet, and with locks of a capacity to pass barges having a net tonnage capacity of 2,500 tons each. It is anticipated that this entire enlargement will be completed during the year 1913. The cost of enlarging these three canals is not to exceed $101,000,000.

*Religion.*—There is no State or officially recognized religion in the United States. Every form of religious belief is tolerated by National and State laws, but no sectarian distinctions are permitted to be considered in public legislation, the prevailing sentiment of the country being that each sect or denomination must maintain itself without any public aid. The Roman Catholic is the most powerful religious body. Its membership as reported represents the entire Roman Catholic population, as compared with the communicant members of other denominations. It is derived from various sources spread widely over the country. In the Northeastern States it is made up largely of Irish and French-Canadian stock, while further W. along the shores of the Great Lakes the Roman Catholics are chiefly French Canadians by birth or extraction. The Methodist and Baptist denominations are strongest in the Southern States; the Presbyterian in the Middle and Southern States and the upper Mississippi valley; the Episcopalian in the Northeastern States; and the Congregational mostly in New England.

According to a special report of the Bureau of the Census on "Religious Bodies" (2 vols., 1910), there was a total of 212,230 religious organizations, having 192,795 church edifices and 14,791 other places of worship; 164,830 ministers; 32,936,445 communicants or members; church property valued at $1,257,575,867; parsonages and rectories, 54,214, valued at $143,495,853; and 178,214 Sunday-schools, with 1,648,664 officers and teachers, and 14,685,997 scholars. The following table gives a summary of the report by denominational bodies:

| Bodies. | Organizations. | Ministers. | Communicants. |
|---|---|---|---|
| All bodies | 212,230 | 164,830 | 32,936,445 |
| Protestant bodies | 194,497 | 146,451 | 20,287,742 |
| Adventist | 2,537 | 1,152 | 92,735 |
| Baptist | 54,707 | 43,790 | 5,662,234 |
| Christians | 1,534 | 1,011 | 110,117 |
| Christian Scientist | 635 | 1,276 | 85,717 |
| Congregational | 5,700 | 5,802 | 700,480 |
| Disciples | 10,909 | 8,741 | 1,142,359 |
| Dunkers | 1,090 | 2,255 | 97,144 |
| Evangelical | 2,730 | 1,495 | 174,780 |
| Friends | 1,141 | 1,479 | 113,772 |
| Ger. Evang. Syn. N. A. | 1,198 | 972 | 293,137 |
| Independent | 1,065 | ** | 73,673 |
| Lutheran | 12,642 | 7,841 | 2,112,494 |
| Mennonite | 604 | 1,006 | 54,798 |
| Methodist | 64,255 | 39,737 | 5,749,838 |
| Presbyterian | 15,471 | 12,456 | 1,830,555 |
| Prot. Episcopal | 6,725 | 5,368 | 886,942 |
| Reformed | 2,583 | 2,039 | 449,514 |
| Unitarian | 435 | 541 | 70,542 |
| Unit. Brethern | 4,268 | 2,435 | 296,050 |
| Universalist | 811 | 724 | 64,158 |
| Other Protestant | 3,637 | 6,331 | 226,703 |
| Roman Catholic | 12,472 | 15,177 | *12,079,142 |
| Jewish | 1,152 | 1,084 | †101,457 |
| Latter-day Saints | 1,184 | 1,774 | 256,647 |
| Eastern Orthodox | 411 | 108 | 129,606 |
| All other | 702 | 236 | 81,851 |

*All members of families. †Heads of families only.
**Not reported.

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*Education.*—The United States has no national system of public school administration, leaving the primary responsibility for educational control entirely with the several States; but it has a national program of education, which it is constantly promoting by most liberal measures, through its Bureau of Education. The total school population now exceeds 25,000,000, nearly evenly divided between boys and girls; the enrollment in the public schools is over 17,000,000; the average daily attendance, over 12,000,000; the number of teachers, about 500,000; buildings used for school purposes, over 260,000; value of public school property, $945,000,000; total revenue, about $382,000,000; total expenditure, $371,500,000.

For higher education there are about 500 universities colleges, and technological schools, with 30,000 professors and instructors, and 280,200 students in all departments. These institutions have productive funds aggregating over $260,750,000; scientific apparatus valued at about $35,000,000; grounds and buildings valued at over $220,000,000; and an average annual income of $66,000,000. Professional schools other than technological embrace the following:

| Class. | Number. | Teachers. | Students. |
|---|---|---|---|
| Theological | 162 | 1,350 | 10,218 |
| Legal | 109 | 1,343 | 18,553 |
| Medical, Regular | 116 | 6,802 | 20,519 |
| " Homœopathic | 17 | 780 | 997 |
| " Eclectic | 11 | 375 | 642 |
| Dental | 55 | 1,609 | 6,178 |
| Pharmacy | 78 | 802 | 5,999 |
| Nurse Training | 1,096 | ..... | 29,320 |
| Veterinary | 19 | 373 | 2,677 |
| Total | 1,663 | 13,434 | 94,103 |

The principal institutions of the country will be found throughout this work under their class or individual names.

*Banking.*—During the period of 1900-1910 the growth in the number and volume of business of the banking institutions of the country was especially marked. In 1900 the total number of banks in operation was estimated at 13,977, with capital of $1,150,728,675. In 1910 the number had increased to 27,263 banks, with aggregate capital of $1,957,138,888. The National banks increased since 1900 from 3,732, with aggregate capital of $621,536,461, to 7,145 on June 30, 1910, with aggregate capital of $989,567,114; other reporting banks from 6,650, with aggregate capital of $403,192,214 in 1900 to 15,950, with aggregate capital of $890,376,774. In 1900 the non-reporting banks were estimated at 3,595, with capital of $126,000,000. In 1910 banks non-reporting were estimated at 4,168, with capital of $77,195,000.

The following table shows for 1910 the

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banking power of the United States, including the island possessions, as indicated by the volume of capital, surplus, deposits, and circulation:

| Class. | Number. | Capital. | Surplus, etc. | Deposits. | Circulation. | Total. |
|---|---|---|---|---|---|---|
| National banks ..... | 7,145 | $989,567,114 | $861,403,608 | *a*$5,341,757,662 | $675,632,565 | $7,868,360,949 |
| State, etc., banks..... | 15,950 | 890,376,774 | 1,091,072,210 | 9,996,179,942 | ..... | 12,553,695,826 |
| Non reporting banks*b*. | 4,168 | 77,195,000 | 28,346,568 | 521,646,040 | ..... | 627,187,608 |
| | 27,263 | $1,957,138,888 | $1,980,822,386 | $15,859,583,644 | $675,632,565 | $21,049,244,383 |

*a* Includes government deposits.
*b* Number of banks and amounts estimated upon statements from reporting private banks.

The banking institutions in our island possessions comprise the following: Philippines, 9 banks; capital, $1,630,418; surplus, $149,176; deposits, $13,871,094; total resources, $23,869,177; Hawaii, 4 National and 10 other banks; capital, $2,643,170; surplus, $1,124,211; deposits, $14,754,076; total resources, $19,062,860; Porto Rico, 1 National and 9 other banks; capital, $1,478,145; surplus, $950,405; deposits, $11,343,017; total resources, $16,047,354.

According to the report of the Comptroller of the Currency for the year ending Sept. 1, 1910, in addition to the foregoing National banks, there were in continental and insular United States 12,166 State banks, with combined capital, $435,822,833; surplus, $187,571,005; deposits, $2,727,926,986; and total resources, $3,694,958,766; 638 mutual savings banks, with surplus, $249,208,817; deposits, $3,360,563,842; and total resources, $3,652,449,198; 1,121 stock savings banks, with capital, $68,320,822; surplus, $27,020,210; deposits, $709,922,403; and total resources, $829,422,246; 1,091 loan and trust companies, with capital, $367,333,556; surplus, $432,718,233; deposits, $3,073,122,706; and total resources, $4,216,850,061; and 934 private banks, with capital, $18,899,561; surplus, $6,541,431; deposits, $124,644,003; and total resources, $160,015,552.

There were 137 clearing houses in continental United States, and in the year ending Sept. 30, 1910, all exchanges aggregated $169,025,172,600. The largest volumes of exchanges were at New York, $102,553,959,100; Chicago, $14,031,258,900; Boston, $8,414,461,900; Philadelphia, $7,760,336,900; St. Louis, $3,704,263,700; Pittsburg, $2,604,069,500; San Francisco, $2,268,678,600; Kansas City, Mo., $2,618,735,000; Baltimore $1,586,091,900; Cincinnati, $1,277,996,900; and Minneapolis, $1,179,569,300 —all others being under $1,000,000,000.

*Building and Loan Associations.*—The United States League of Building and Loan Associations reported 5,737 associations, with membership, 2,029,927; total assets, $860,782,611; increase of assets in a year, $63,783,792; disbursements in a year, $579,892,352, of which $224,349,510 were mortgage loans.

*School Savings Banks.*—The school savings bank system was reported in operation in Canada, Porto Rico, South and Western Australia, as well as in the United States. It had been established in 1,168 schools, having 8,515 banks, and 203,458 depositing pupils. In the United States alone there were 7,065 banks in 530 houses, 160,488 depositors, and an aggregate balance to their credit of $721,732. From the date of the introduction of the system, the amount of money deposited by school children amounted to $5,051,644.

*Insurance.*—The United States is the greatest life insurance country in the world, 189 regular or "old line" companies and 796 assessment companies having an aggregate of $25,144,209,882 of insurance in force between them, on 36,849,228 policies. Fire insurance is handled by 322 stock and 272 mutual companies, which disbursed over $300,000,000 and wrote risks of over $34,000,000,000 in a single year. Casualty and surety insurance companies have in force policies representing $8,980,000,000, chiefly for accident and health, employers' liability, fidelity, and surety. Marine insurance was written by 18 companies for $6,222,385,385 in a single year.

*Finances.*—During the fiscal year ending June 30, 1910, the receipts and disbursements of the National Government, with their sources and purposes, were as follows: Receipts: From customs, $333,683,445; from internal revenue, $289,933,519; from miscellaneous sources, $51,894,751—total ordinary receipts, $675,511,715; public debt receipts, $31,674,292. Disbursements: For civil and miscellaneous purposes, $180,076,442; for the War Department, $155,911,706; for the Navy Department, $123,173,717; for Indians, $18,504,131; for pensions, $160,696,416; for interest on the public debt, $21,342,979—total ordinary disbursements, $659,705,391; for the Panama Canal, $33,911,673; for public debt account, $33,049,695; excess of disbursements, $19,480,752; balance in general fund, $106,894,675.

The public debt, less cash in the Treasury, was $1,046,449,185, of which $913,317,490 was interest-bearing, and the debt per capita was $11.64. The wealth of the country was estimated at $107,104,211,917; per capita, $1,310.11. On Jan. 3, 1911, the general stock of money in the United States aggregated $3,509,356,855; the amount held in the Treasury as assets of the government

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was $316,976,469; and the amount in circulation was $3,192,380,386—circulation per capita, $34.25.

*Internal Revenue.*—The collections of internal revenue from taxable manufactures, corporations, banks and bankers, and other sources, during the year ending June 30, 1910, aggregated $289,728,114. The principal sources were: spirits, $148,029,211; fermented liquors, $60,572,288; tobacco, $57,889,351; corporations, $20,959,783; oleomargarine, $1,099,502; playing cards, $565,594; and penalties, $434,705. The largest aggregate collections were in Illinois, $49,165,272; New York, $36,157,326; Kentucky, $32,260,278; Indiana, $28,885,240; and Pennsylvania, $25,961,970.

AMOUNTS OF GOLD AND SILVER COIN AND CERTIFICATES, UNITED STATES NOTES, AND NATIONAL BANK NOTES IN CIRCULATION AND IN THE TREASURY JANUARY 3, 1911:

| CLASSIFICATION | General stock of money in the United States. | Held in Treasury as assets of the Government.[1] | Money in Circulation. |
|---|---|---|---|
| | Dollars. | Dollars. | Dollars. |
| Gold coin (including bullion in Treasury) | 1,708,828,297 | 180,322,541 | 605,650,087 |
| Gold certificates[2] | ..... | 73,681,030 | 849,174,639 |
| Standard silver dollars | 564,805,508 | 3,440,089 | 75,794,419 |
| Silver certificates[2] | ..... | 11,237,501 | 474,333,499 |
| Subsidiary silver | 157,864,053 | 15,401,350 | 142,462,703 |
| Treasury notes of 1890 | 3,472,000 | 10,507 | 3,461,493 |
| United States notes | 346,681,016 | 9,268,762 | 337,412,254 |
| Currency certificates, act of June 8, 1872[2] | ..... | ..... | ..... |
| National bank notes | 727,705,981 | 23,614,689 | 704,091,292 |
| Total | 3.509,356,855 | 316,976,469 | 3,192,380,386 |

[1]This statement of money held in the Treasury as assets of the government does not include deposits of public money in national bank depositaries to the credit of the Treasurer of the United States, and amounting to $35,542,254.

[2]For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury, and is not included in the account of money held as assets of the government.

Population of the United States Jan. 3, 1911, estimated at 93,203,000; circulation per capita, $34.25.

*Federal Union.*—The following tables show the organization of the Federal Union and its subsequent enlargement:

THE THIRTEEN ORIGINAL STATES.

| | States. | Ratified the Constitution. |
|---|---|---|
| 1 | Delaware | 1787, Dec. 7. |
| 2 | Pennsylvania | 1787, Dec. 12. |
| 3 | New Jersey | 1787, Dec. 18. |
| 4 | Georgia | 1788, Jan. 2. |
| 5 | Connecticut | 1788, Jan. 9. |
| 6 | Massachusetts | 1788, Feb. 6. |
| 7 | Maryland | 1788, April 28. |
| 8 | South Carolina | 1788, May 23. |
| 9 | New Hampshire | 1788, June 21. |
| 10 | Virginia | 1788, June 26. |
| 11 | New York | 1788, July 26. |
| 12 | North Carolina | 1789, Nov. 21. |
| 13 | Rhode Island | 1790, May 29. |

STATES ADMITTED TO THE UNION.

| | States. | Admitted.* |
|---|---|---|
| 1 | Vermont | 1791, March 4. |
| 2 | Kentucky | 1792, June 1. |
| 3 | Tennessee | 1796, June 1. |
| 4 | Ohio | 1803, Feb. 19. |
| 5 | Louisiana | 1812, April 30. |
| 6 | Indiana | 1816, Dec. 11. |
| 7 | Mississippi | 1817, Dec. 10. |
| 8 | Illinois | 1818, Dec. 3. |
| 9 | Alabama | 1819, Dec. 14. |
| 10 | Maine | 1820, March 15. |
| 11 | Missouri | 1821, Aug. 10. |
| 12 | Arkansas | 1836, June 15. |
| 13 | Michigan | 1837, Jan. 26. |
| 14 | Florida | 1845, March 3. |
| 15 | Texas | 1845, Dec. 29. |
| 16 | Iowa | 1846, Dec. 28. |
| 17 | Wisconsin | 1848, May 29. |
| 18 | California | 1850, Sept. 9. |
| 19 | Minnesota | 1858, May 11. |
| 20 | Oregon | 1859, Feb. 14. |
| 21 | Kansas | 1861, Jan. 29. |
| 22 | West Virginia | 1863, June 19. |
| 23 | Nevada | 1864, Oct. 31. |
| 24 | Nebraska | 1867, March 1. |
| 25 | Colorado | 1876, Aug. 1. |
| 26 | North Dakota | 1889, Nov. 2. |
| 27 | South Dakota | 1889, Nov. 2. |
| 28 | Montana | 1889, Nov. 8. |
| 29 | Washington | 1889, Nov. 11. |
| 30 | Idaho | 1890, July 3. |
| 31 | Wyoming | 1890, July 11. |
| 32 | Utah | 1896, Jan. 4. |
| 33 | Oklahoma | 1907, Nov. 16. |

THE TERRITORIES.

| Territories. | Organized. |
|---|---|
| New Mexico† | Sept. 9, 1850. |
| Arizona | Feb. 24, 1863. |
| District of Columbia | July 16, 1790. / March 3, 1791. |
| District of Alaska | July 27, 1868. |
| Hawaii | June 14, 1900. |

*Date when admission took effect is given from United States Census reports. In many instances the act of admission by Congress was passed on a previous date. Ohio was recognized as a State by Congress on the date given. The census reports make the date Nov. 29, 1802, the day the Convention to form a Constitution adjourned.

†In 1910 Congress provided for the admission of Arizona and New Mexico into separate Statehood.

New Possessions.—A government for Porto Rico was established by the Fifty-Sixth Congress May 1, 1900. The Philippines are under civil government appointed by the President with a native elective Assembly, and Guam and Tutuila under governors appointed by the President.

*Population.*—The following table shows the population of the United States according to each decennial census:

| Year. | Population. | Year. | Population. |
|---|---|---|---|
| 1790..... | 3,929,214 | 1860..... | 31,443,321 |
| 1800..... | 5,308,483 | 1870..... | 38,558,371 |
| 1810..... | 7,239,881 | 1880..... | 50,155,783 |
| 1820..... | 9,638,453 | 1890..... | 62,947,714 |
| 1830..... | 12,866,020 | 1900..... | 75,994,575 |
| 1840..... | 17,069,453 | 1910..... | 91,972,266 |
| 1850..... | 23,191,876 | | |

*Population Prior to 1790* (according to Bancroft): 1688, 200,000; 1714, 434,600; 1727, 580,000; 1750, 1,260,000; 1754, 1,425,000; 1760, 1,695,000; 1770, 2,312,000; 1780, 2,945,000 (2,383,000 white, 562,000 colored).

*Population 1900-1910.*—The following table shows the population of each of the States and Territories in 1910 and the increase since 1900:

| States and Territories. | Population, 1910. | Increase since 1900. |
|---|---|---|
| Alabama ..... | 2,138,093 | 309,396 |
| Alaska ..... | 64,356 | 764 |
| Arizona ..... | 204,354 | 81,423 |
| Arkansas ..... | 1,574,449 | 262,885 |
| California ..... | 2,377,549 | 892,496 |
| Colorado ..... | 799,024 | 259,324 |
| Connecticut ..... | 1,114,756 | 206,336 |
| Delaware ..... | 202,322 | 17,587 |
| District of Columbia.... | 331,069 | 52,351 |
| Florida ..... | 751,139 | 222,597 |
| Georgia ..... | 2,609,121 | 392,790 |
| Idaho ..... | 325,594 | 163,822 |
| Illinois ..... | 5,638,591 | 817,041 |
| Indiana ..... | 2,700,876 | 184,414 |
| Iowa ..... | 2,224,771 | *7,082 |
| Kansas ..... | 1,690,949 | 220,454 |
| Kentucky ..... | 2,289,095 | 142,731 |
| Louisiana ..... | 1,656,388 | 274,763 |
| Maine ..... | 742,371 | 47,905 |
| Maryland ..... | 1,295,346 | 107,302 |
| Massachusetts ..... | 3,366,416 | 561,070 |
| Michigan ..... | 2,810,173 | 389,191 |
| Minnesota ..... | 2,075,708 | 324,314 |
| Mississippi ..... | 1,797,114 | 245,844 |
| Missouri ..... | 3,293,335 | 186,670 |
| Montana ..... | 376,053 | 132,724 |
| Nebraska ..... | 1,192,214 | 125,914 |
| Nevada ..... | 81,875 | 39,540 |
| New Hampshire ..... | 430,572 | 18,984 |
| New Jersey ..... | 2,537,167 | 653,498 |
| New Mexico..... | 327,301 | 131,991 |
| New York ..... | 9,113,614 | 1,844,720 |
| North Carolina ..... | 2,206,287 | 312,477 |
| North Dakota ..... | 577,056 | 257,910 |
| Ohio ..... | 4,767,121 | 609,576 |
| Oklahoma ..... | †1,657,155 | †866,764 |
| Oregon ..... | 672,765 | 259,229 |
| Pennsylvania ..... | 7,665,111 | 1,362,996 |
| Rhode Island ..... | 542,610 | 114,054 |
| South Carolina ..... | 1,515,400 | 175,084 |
| South Dakota ..... | 583,888 | 182,318 |
| Tennessee ..... | 2,184,789 | 164,173 |
| Texas ..... | 3,896,542 | 847,832 |
| Utah ..... | 373,351 | 96,602 |
| Vermont ..... | 355,956 | 12,315 |
| Virginia ..... | 2,061,612 | 207,428 |
| Washington ..... | 1,141,990 | 623,887 |
| West Virginia ..... | 1,221,119 | 262,319 |
| Wisconsin ..... | 2,333,860 | 264,818 |
| Wyoming ..... | 145,965 | 53,434 |
| Total..... | 91,972,266 | 15,977,691 |

*Decrease.

†Since Nov. 16, 1907, includes the former Indian Territory, which had a population of 392,060 in 1900.

Including the population of the Philippine Islands (census of 1903), 7,635,426; Hawaii (1910), 191,909; Porto Rico (1910), 1,118,012; persons in military and naval service abroad, 55,608; and estimates for Guam, Samoa, and the Panama Canal Zone, there was a total of about 101,100,000 under the flag.





*Government.*—The form of government of the United States is based on the Constitution of Sept. 17, 1787, to which 10 amendments were added Dec. 15, 1791; an 11th amendment, Jan. 8, 1798; a 12th amendment, Sept. 25, 1804; a 13th amendment, Dec. 18, 1865; a 14th amendment, July 28, 1868; and a 15th amendment, March 30, 1870. By the Constitution the government of the nation is intrusted to three separate authorities, the Executive, the Legislative, and the Judicial. The executive power is vested in a President, who holds his office during the term of four years, and is elected, together with a Vice-President, in a prescribed manner. The Constitution enacts that "no person except a natural-born citizen, or a citizen of the United States at the time of the adoption of this Constitution, shall be eligible to the office of President; neither shall any person be eligible to that office who shall not have attained the age of 35 years, and been 14 years a resident within the United States." The Vice-President is *ex-officio* President of the Senate. The presidential succession is fixed by chapter 4 of the acts of the 49th Congress, 1st session. In case of the removal, death, resignation, or inability of both the President and Vice-President, then the Secretary of State shall act as President till the disability of the President or Vice-President is removed or a President is elected. If there be no Secretary of State, then the Secretary of the Treasury will act; and the remainder of the order of succession is: Secretary of War, Attorney-General, Postmaster-General, Secretary of the Navy, and Secretary of the Interior (the office of Secretary of Agriculture was created after the passage of the act). The acting President must, on taking office, convene Congress, if not at the time in session, in extraordinary session, giving 20 days' notice. This act applies only to such Cabinet officers as shall have been appointed bffiy the advice and consent of the Senate and are eligible under the Constitution to the presidency. The following is a list of the Presidents and Vice-Presidents since the inauguration of the government, together with their cabinet officers:

PRESIDENTS OF THE UNITED STATES.

| No. | Name. | Qualified. |
|---|---|---|
| 1 | George Washington .....April | 30, 1789. |
| | George Washington .....March | 4, 1793. |
| 2 | John Adams .....March | 4, 1797. |
| 3 | Thomas Jefferson .....March | 4, 1801. |
| | Thomas Jefferson .....March | 4, 1805. |
| 4 | James Madison .....March | 4, 1809. |
| | James Madison .....March | 4, 1813. |
| 5 | James Monroe .....March | 4, 1817. |
| | James Monroe .....March | 5, 1821. |
| 6 | John Quincy Adams .....March | 4, 1825. |
| 7 | Andrew Jackson .....March | 4, 1829. |
| | Andrew Jackson .....March | 4, 1833. |
| 8 | Martin Van Buren .....March | 4, 1837. |
| 9 | William H. Harrison.....March | 5, 1841. |
| 10 | John Tyler .....April | 6, 1841. |
| 11 | James K. Polk .....March | 4, 1845. |

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| No. | Name. | Qualified. |
|---|---|---|
| 12 | Zachary Taylor | March 5, 1849. |
| 13 | Millard Fillmore | July 9, 1850. |
| 14 | Franklin Pierce | March 4, 1853. |
| 15 | James Buchanan | March 4, 1857. |
| 16 | Abraham Lincoln | March 4, 1861. |
| | Abraham Lincoln | March 4, 1865. |
| 17 | Andrew Johnson | April 15, 1865. |
| 18 | Ulysses S. Grant | March 4, 1869. |
| | Ulysses S. Grant | March 4, 1873. |
| 19 | Rutherford B. Hayes | March 5, 1877. |
| 20 | James A. Garfield | March 4, 1881. |
| 21 | Chester A. Arthur | Sept. 20, 1881. |
| 22 | Grover Cleveland | March 4, 1885. |
| 23 | Benjamin Harrison | March 4, 1889. |
| 24 | Grover Cleveland | March 4, 1893. |
| 25 | William McKinley | March 4, 1897. |
| | William McKinley | March 4, 1901. |
| 26 | Theodore Roosevelt | Sept. 14, 1901. |
| | Theodore Roosevelt | March 4, 1905. |
| 27 | William H. Taft | March 4, 1909. |

VICE-PRESIDENTS OF THE UNITED STATES.

| No. | Name. | Qualified. |
|---|---|---|
| 1 | John Adams | June 3, 1789. |
| | John Adams | Dec. 2, 1793. |
| 2 | Thomas Jefferson | March 4, 1797. |
| 3 | Aaron Burr | March 4, 1801. |
| 4 | George Clinton | March 4, 1805 |
| | George Clinton | March 4, 1809. |
| | William H. Crawford | April 10, 1812. |
| 5 | Elbridge Gerry | March 4, 1813. |
| | John Gaillard | Nov. 25, 1814. |
| 6 | Daniel D. Tompkins | March 4, 1817. |
| | Daniel D. Tompkins | March 5, 1821. |
| 7 | John C. Calhoun | March 4, 1825. |
| | John C. Calhoun | March 4, 1829. |
| | Hugh L. White | Dec. 28, 1832. |
| 8 | Martin Van Buren | March 4, 1833. |
| 9 | Richard M. Johnson | March 4, 1837. |
| 10 | John Tyler | March 5, 1841. |
| | Samuel L. Southard | April 6, 1841. |
| | Willie P. Mangum | May 31, 1842. |
| 11 | George M. Dallas | March 4, 1845. |
| 12 | Millard Fillmore | March 5, 1849. |
| | William R. King | July 11, 1850. |
| 13 | William R. King | March 4, 1853. |
| | David R. Atchison | April 18, 1853. |
| | Jesse D. Bright | Dec. 5, 1854. |
| 14 | John C. Breckinridge | March 4, 1857. |
| 15 | Hannibal Hamlin | March 4, 1861. |
| 16 | Andrew Johnson | March 4, 1865. |
| | Lafayette S. Foster | April 15, 1865. |
| | Benjamin F. Wade | March 2, 1867. |
| 17 | Schuyler Colfax | March 4, 1869. |
| 18 | Henry Wilson | March 4, 1873. |
| | Thomas W. Ferry | Nov. 22, 1875. |
| 19 | William A. Wheeler | March 5, 1877. |
| 20 | Chester A. Arthur | March 4, 1881. |
| | Thomas F. Bayard | Oct. 10, 1881. |
| | David Davis | Oct. 13, 1881. |
| | George F. Edmunds | March 3, 1883. |
| 21 | Thomas A. Hendricks | March 4, 1885. |
| | John Sherman | Dec. 7, 1885. |
| 22 | Levi P. Morton | March 4, 1889. |
| 23 | Adlai Stevenson | March 4, 1893. |
| 24 | Garret A. Hobart | March 4, 1897. |
| 25 | Theodore Roosevelt | March 4, 1901. |
| 26 | Charles W. Fairbanks | March 4, 1905. |
| 27 | James S. Sherman | March 4, 1909. |

SECRETARIES OF STATE.

| Name. | Residences. | Appointed. |
|---|---|---|
| Thomas Jefferson | Va. | 1789 |
| Edmund Randolph | Va. | 1794 |
| Timothy Pickering | Mass. | 1795 |
| Timothy Pickering | Mass. | 1797 |
| John Marshall | Va. | 1800 |
| James Madison | Va. | 1801 |
| Robert Smith | Md. | 1809 |
| James Monroe | Va. | 1811 |
| John Quincy Adams | Mass. | 1817 |
| Henry Clay | Ky. | 1825 |
| Martin Van Buren | N. Y. | 1829 |
| Edward Livingston | La. | 1831 |
| Louis McLane | Del. | 1833 |
| John Forsyth | Ga. | 1834 |
| John Forsyth | Ga. | 1837 |
| Daniel Webster | Mass. | 1841 |
| Daniel Webster | Mass. | 1841 |
| Hugh S. Legare | S. C. | 1843 |
| Abel P. Upshur | Va. | 1843 |
| John C. Calhoun | S. C. | 1844 |
| James Buchanan | Pa. | 1845 |
| John M. Clayton | Del. | 1849 |
| Daniel Webster | Mass. | 1850 |
| Edward Everett | Mass. | 1852 |
| William L. Marcy | N. Y. | 1853 |
| Lewis Cass | Mich. | 1857 |
| Jeremiah S. Black | Pa. | 1860 |
| William H. Seward | N. Y. | 1861 |
| William H. Seward | N. Y. | 1865 |
| Elihu B. Washburn | Ill. | 1869 |
| Hamilton Fish | N. Y. | 1869 |
| William M. Evarts | N. Y. | 1877 |
| James G. Blaine | Me. | 1881 |
| F. T. Frelinghuysen | N. J. | 1881 |
| Thomas F. Bayard | Del. | 1885 |
| James G. Blaine | Me. | 1889 |
| John W. Foster | Ind. | 1892 |
| Walter Q. Gresham | Ill. | 1893 |
| Richard Olney | Mass. | 1895 |
| John Sherman | Ohio | 1897 |
| William R. Day | Ohio | 1897 |
| John Hay | Ohio | 1898 |
| Elihu Root | N. Y. | 1905 |
| Robert Bacon | N. Y. | 1909 |
| Philander C. Knox | Pa. | 1909 |

SECRETARIES OF THE TREASURY.

| Name. | Residences. | Appointed. |
|---|---|---|
| Alexander Hamilton | N. Y. | 1789 |
| Oliver Wolcott | Ct. | 1795 |
| Oliver Wolcott | Ct. | 1797 |
| Samuel Dexter | Mass. | 1801 |
| Samuel Dexter | Mass. | 1801 |
| Albert Gallatin | Pa. | 1801 |
| Albert Gallatin | Pa. | 1809 |
| George W. Campbell | Tenn. | 1814 |
| Alexander J. Dallas | Pa. | 1814 |
| William H. Crawford | Ga. | 1816 |
| William H. Crawford | Ga. | 1817 |
| Richard Rush | Pa. | 1825 |
| Samuel D. Ingham | Pa. | 1829 |
| Louis McLane | Del. | 1831 |
| William J. Duane | Pa. | 1833 |
| Roger B. Taney | Md. | 1833 |
| Levi Woodbury | N. H. | 1834 |
| Levi Woodbury | N. H. | 1837 |
| Thomas Ewing | Ohio | 1841 |
| Thomas Ewing | Ohio | 1841 |
| Walter Forward | Pa. | 1841 |
| John C. Spencer | N. Y. | 1843 |
| George M. Bibb | Ky. | 1844 |
| Robert J. Walker | Miss. | 1845 |
| William M. Meredith | Pa. | 1849 |
| Thomas Corwin | Ohio | 1850 |
| James Guthrie | Ky. | 1853 |
| Howell Cobb | Ga. | 1857 |
| Philip F. Thomas | Md. | 1860 |
| John A. Dix | N. Y. | 1861 |
| Salmon P. Chase | Ohio | 1861 |
| William P. Fessenden | Me. | 1864 |
| Hugh McCulloch | Ind. | 1865 |
| Hugh McCulloch | Ind. | 1865 |
| George S. Boutwell | Mass. | 1869 |
| Wm. A. Richardson | Mass. | 1873 |
| Benjamin H. Bristow | Ky. | 1874 |
| Lot M. Morrill | Me. | 1876 |
| John Sherman | Ohio | 1877 |
| William Windom | Minn. | 1881 |
| Charles J. Folger | N. Y. | 1881 |
| Walter Q. Gresham | Ind. | 1884 |
| Hugh McCulloch | Ind. | 1884 |
| Daniel Manning | N. Y. | 1885 |
| Charles S. Fairchild | N. Y. | 1887 |
| William Windom | Minn. | 1889 |
| Charles Foster | Ohio | 1891 |
| John G. Carlisle | Ky. | 1893 |
| Lyman J. Gage | Ill. | 1897 |
| Leslie M. Shaw | Iowa | 1901 |
| George B. Cortelyou | N. Y. | 1907 |
| Franklin MacVeagh | Ill. | 1909 |

United States of America

## SECRETARIES OF WAR.

| Name. | Residences. | Appointed. |
|---|---|---|
| Henry Knox | Mass. | 1789 |
| Timothy Pickering | Mass. | 1795 |
| James McHenry | Md. | 1796 |
| James McHenry | Md. | 1797 |
| John Marshall | Va. | 1800 |
| Samuel Dexter | Mass. | 1800 |
| Roger Griswold | Ct. | 1801 |
| Henry Dearborn | Mass. | 1801 |
| William Eustis | Mass. | 1809 |
| John Armstrong | N. Y. | 1813 |
| James Monroe | Va. | 1814 |
| William H. Crawford | Ga. | 1815 |
| Isaac Shelby | Ky. | 1817 |
| Geo. Graham (*ad in.*) | Va. | 1817 |
| John C. Calhoun | S. C. | 1817 |
| James Barbour | Va. | 1825 |
| Peter B. Porter | N. Y. | 1828 |
| John H. Eaton | Tenn. | 1829 |
| Lewis Cass | Ohio | 1831 |
| Benjamin F. Butler | N. Y. | 1837 |
| Joel R. Poinsett | S. C. | 1837 |
| John Bell | Tenn. | 1841 |
| John Bell | Tenn. | 1841 |
| John McLean | Ohio | 1841 |
| John C. Spencer | N. Y. | 1841 |
| James M. Porter | Pa. | 1843 |
| William Wilkins | Pa. | 1844 |
| William L. Marcy | N. Y. | 1845 |
| George W. Crawford | Ga. | 1849 |
| Edward Bates | Mo. | 1850 |
| Charles M. Conrad | La. | 1850 |
| Jefferson Davis | Miss. | 1853 |
| John B. Floyd | Va. | 1857 |
| Joseph Holt | Ky. | 1861 |
| Simon Cameron | Pa. | 1861 |
| Edwin M. Stanton | Ohio | 1862 |
| U. S. Grant (*ad in.*) | Ill. | 1867 |
| Lor. Thomas (*ad in.*) | | 1868 |
| John M. Schofield | N. Y. | 1868 |
| John A. Rawlins | Ill. | 1869 |
| William T. Sherman | Ohio | 1869 |
| William W. Belknap | Iowa | 1869 |
| Alphonso Taft | Ohio | 1876 |
| James Donald Cameron | Pa. | 1876 |
| George W. McCrary | Iowa | 1877 |
| Alexander Ramsey | Minn. | 1879 |
| Robert T. Lincoln | Ill. | 1881 |
| William C. Endicott | Mass. | 1885 |
| Redfield Proctor | Vt. | 1889 |
| Stephen B. Elkins | W. Va. | 1891 |
| Daniel S. Lamont | N. Y. | 1893 |
| Russell A. Alger | Mich. | 1897 |
| Elihu Root | N. Y. | 1899 |
| William H. Taft | Ohio | 1904 |
| Luke E. Wright | Tenn | 1908 |
| Jacob M. Dickinson | Tenn | 1909 |
| Henry L. Stimson | N. Y | 1911 |

## SECRETARIES OF THE INTERIOR

| Name. | Residences. | Appointed. |
|---|---|---|
| Thomas Ewing | Ohio | 1849 |
| James A. Pearce | Md. | 1850 |
| Thos. M. T. McKernon | Pa. | 1850 |
| Alexander H. H. Stuart | Va. | 1850 |
| Robert McClelland | Mich. | 1853 |
| Jacob Thompson | Miss. | 1857 |
| Caleb B. Smith | Ind. | 1861 |
| John P. Usher | Ind. | 1863 |
| John P. Usher | Ind. | 1865 |
| James Harlan | Iowa | 1865 |
| Orville H. Browning | Ill. | 1866 |
| Jacob D. Cox | Ohio | 1869 |
| Columbus Delano | Ohio | 1870 |
| Zachariah Chandler | Mich. | 1875 |
| Carl Schurz | Mo. | 1877 |
| Samuel J. Kirkwood | Iowa | 1881 |
| Henry M. Teller | Col. | 1882 |
| Lucius Q. C. Lamar | Miss. | 1885 |
| William F. Vilas | Wis. | 1888 |
| John W. Noble | Mo. | 1889 |
| Hoke Smith | Ga. | 1893 |
| David R. Francis | Mo. | 1896 |
| Cornelius N. Bliss | N. Y. | 1897 |
| Ethan A. Hitchcock | Mo | 1899 |
| James R. Garfield | Ohio | 1907 |
| Richard A. Ballinger | Wash | 1909 |
| Walter L. Fisher | Ill | 1911 |

## SECRETARIES OF THE NAVY.

| Name. | Residences. | Appointed. |
|---|---|---|
| George Cabot* | Mass. | 1798 |
| Benjamin Stoddert | Md. | 1798 |
| Benjamin Stoddert | Md. | 1801 |
| Robert Smith | Md. | 1801 |
| Jacob Crowninshield | Mass. | 1805 |
| Paul Hamilton | S. C. | 1809 |
| William Jones | Pa. | 1813 |
| B. W. Crowninshield | Mass. | 1814 |
| B. W. Crowninshield | Mass. | 1817 |
| Smith Thompson | N. Y. | 1818 |
| Samuel L. Southard | N. J. | 1823 |
| Samuel L. Southard | N. J. | 1825 |
| John Branch | N. C. | 1829 |
| Levi Woodbury | N. H. | 1831 |
| Mahlon Dickerson | N. J. | 1834 |
| Mahlon Dickerson | N. J. | 1837 |
| James K. Paulding | N. Y. | 1838 |
| George E. Badger | N. C. | 1841 |
| George E. Badger | N. C. | 1841 |
| Abel P. Upshur | Va. | 1841 |
| David Henshaw | Mass. | 1843 |
| Thomas W. Gilmer | Va. | 1844 |
| John Y. Mason | Va. | 1844 |
| George Bancroft | Mass. | 1845 |
| John Y. Mason | Va. | 1846 |
| William B. Preston | Va. | 1849 |
| William A. Graham | N. C. | 1850 |
| John P. Kennedy | Md. | 1852 |
| James C. Dobbin | N. C. | 1853 |
| Isaac Toucey | Ct. | 1857 |
| Gideon Welles | Ct. | 1861 |
| Gideon Welles | Ct. | 1865 |
| Adolph E. Borie | Pa. | 1869 |
| George M. Robeson | N. J. | 1869 |
| Richard W. Thompson | Ind. | 1877 |
| Nathan Goff, Jr | W. Va. | 1881 |
| William H. Hunt | La. | 1881 |
| William E. Chandler | N. H. | 1882 |
| William C. Whitney | N. Y. | 1885 |
| Benjamin F. Tracy | N. Y. | 1889 |
| Hilary A. Herbert | Ala. | 1893 |
| John D. Long | Mass. | 1897 |
| William H. Moody | Mass. | 1902 |
| Paul Morton | Ill. | 1904 |
| Charles J. Bonaparte | Md. | 1905 |
| Victor H. Metcalf | Cal. | 1907 |
| Truman H. Newberry | Mich | 1908 |
| George von L. Meyer | Mass | 1909 |

*Appointed by the President and confirmed by the Senate, but did not act.

## SECRETARIES OF AGRICULTURE.

| Name. | Residences. | Appointed. |
|---|---|---|
| Norman J. Colman | Mo. | 1889 |
| Jeremiah M. Rusk | Wis. | 1889 |
| J. Sterling Morton | Neb. | 1893 |
| James Wilson | Iowa | 1897 |

## POSTMASTERS-GENERAL.

| Name. | Residences. | Appointed. |
|---|---|---|
| Samuel Osgood | Mass. | 1789 |
| Timothy Pickering | Mass. | 1791 |
| Joseph Habersham | Ga. | 1795 |
| Joseph Habersham | Ga. | 1797 |
| Gideon Granger | Ga. | 1801 |
| Joseph Habersham | Ct. | 1801 |
| Gideon Granger | Ct. | 1809 |
| Return J. Meigs, Jr | Ohio | 1814 |
| Return J. Meigs, Jr | Ohio | 1817 |
| John McLean | Ohio | 1823 |
| John McLean | Ohio | 1825 |
| William T. Barry | Ky. | 1829 |
| Amos Kendall | Ky. | 1835 |
| Amos Kendall | Ky. | 1837 |
| John M. Niles | Ct. | 1840 |
| Francis Granger | N. Y. | 1841 |
| Francis Granger | N. Y. | 1841 |
| Charles A. Wickliffe | Ky. | 1841 |
| Cave Johnson | Tenn. | 1845 |
| Jacob Collamer | Vt. | 1849 |
| Nathan K. Hall | N. Y. | 1850 |
| Samuel D. Hubbard | Ct. | 1852 |
| James Campbell | Pa. | 1853 |
| Aaron V. Brown | Tenn. | 1857 |
| Joseph Holt | Ky. | 1859 |
| Horatio King | Me. | 1861 |

| Name. | Residences. | Appointed. |
|---|---|---|
| Montgomery Blair | Md. | 1861 |
| William Dennison | Ohio | 1864 |
| William Dennison | Ohio | 1865 |
| Alexander W. Randall | Wis. | 1866 |
| John A. J. Creswell | Md. | 1869 |
| James W. Marshall | Va. | 1874 |
| Marshall Jewell | Ct. | 1874 |
| James N. Tyner | Ind. | 1876 |
| David McK. Key | Tenn. | 1877 |
| Horace Maynard | Tenn. | 1880 |
| Thomas L. James | N. Y. | 1881 |
| Timothy O. Howe | Wis. | 1881 |
| Walter Q. Gresham | Ind. | 1883 |
| Frank Hatton | Iowa | 1884 |
| William F. Vilas | Wis. | 1885 |
| Don M. Dickinson | Mich. | 1888 |
| John Wanamaker | Pa. | 1889 |
| Wilson S. Bissell | N. Y. | 1893 |
| William L. Wilson | W. Va. | 1895 |
| James A. Gary | Md. | 1897 |
| Charles Emory Smith | Pa. | 1898 |
| Henry C. Payne | Wis. | 1901 |
| Robert J. Wynne | Pa. | 1904 |
| George B. Cortelyou | N. Y. | 1905 |
| George von L. Meyer | Mass. | 1907 |
| Frank H. Hitchcock | Mass. | 1909 |

The Postmaster-General was not considered a Cabinet officer until 1829.

ATTORNEYS-GENERAL.

| Name. | Residences. | Appointed. |
|---|---|---|
| Edmund Randolph | Va. | 1789 |
| William Bradford | Pa. | 1794 |
| Charles Lee | Va. | 1795 |
| Charles Lee | Va. | 1797 |
| Theophilus Parsons | Mass. | 1801 |
| Levi Lincoln | Mass. | 1801 |
| Robert Smith | Md. | 1805 |
| John Breckinridge | Ky. | 1805 |
| Cæsar A. Rodney | Del. | 1807 |
| Cæsar A. Rodney | Del. | 1809 |
| William Pinkney | Md. | 1811 |
| Richard Rush | Pa. | 1814 |
| Richard Rush | Pa. | 1817 |
| William Wirt | Va. | 1817 |
| William Wirt | Va. | 1825 |
| John McP. Berrien | Ga. | 1829 |
| Roger B. Taney | Md. | 1831 |
| Benjamin F. Butler | N. Y. | 1833 |
| Benjamin F. Butler | N. Y. | 1837 |
| Felix Grundy | Tenn. | 1838 |
| Henry D. Gilpin | Pa. | 1840 |
| John J. Crittenden | Ky. | 1841 |
| John J. Crittenden | Ky. | 1841 |
| Hugh S. Legare | S. C. | 1841 |
| John Nelson | Md. | 1843 |
| John Y. Mason | Va. | 1845 |
| Nathan Clifford | Me. | 1846 |
| Isaac Toucey | Ct. | 1848 |
| Reverdy Johnson | Md. | 1849 |
| John J. Crittenden | Ky. | 1850 |
| Caleb Cushing | Mass. | 1853 |
| Jeremiah S. Black | Pa. | 1857 |
| Edwin M. Stanton | Ohio | 1860 |
| Edward Bates | Mo. | 1861 |
| Titian J. Coffey (*ad in.*) | Pa. | 1863 |
| James Speed | Ky. | 1864 |
| James Speed | Ky. | 1865 |
| Henry Stanbery | Ohio | 1866 |
| William M. Evarts | N. Y. | 1868 |
| Ebenezer R. Hoar | Mass. | 1869 |
| Amos T. Ackerman | Ga. | 1870 |
| George H. Williams | Ore. | 1871 |
| Edwards Pierrepont | N. Y. | 1875 |
| Alphonso Taft | Ohio | 1876 |
| Charles Devens | Mass. | 1877 |
| Wayne MacVeagh | Pa. | 1881 |
| Benjamin H. Brewster | Pa. | 1881 |
| Augustus H. Garland | Ark. | 1885 |
| William H. H. Miller | Ind. | 1889 |
| Richard Olney | Mass. | 1893 |
| Judson Harmon | Ohio | 1895 |
| Joseph McKenna | Cal. | 1897 |
| John W. Griggs | N. J. | 1897 |
| Philander C. Knox | Pa. | 1901 |
| William H. Moody | Mass. | 1904 |
| Charles J. Bonaparte | Md. | 1907 |
| George W. Wickersham | N. Y. | 1909 |

United States of America

*The Congress.*—The whole legislative power is vested by the Constitution in a Congress, consisting of a Senate and House of Representatives. The Senate consists of two members from each State, chosen by the State Legislatures for six years. Senators must be not less than 30 years of age; must have been citizens of the United States for nine years; and be residents in the States from which they are chosen. Besides its legislative capacity the Senate is invested with the power of confirming or rejecting all appointments to office made by the President, and its members constitute a High Court of Impeachment. The judgment in the latter case extends only to the removal from office and disqualification. Representatives have the sole power of impeachment. The House of Representatives is composed of members elected every second year, by the vote of all male citizens over the age of 21 of the several States of the Union, who are qualified in accordance with the laws of their respective States. By the 15th Amendment to the Constitution, neither race nor color affects the right of citizens. The franchise is not absolutely universal; residence for at least one year in most States (in Michigan and Maine three months) is necessary; in some States the payment of taxes, in others registration. Untaxed Indians and Chinese are excluded from the franchise; in most States convicts, in some States duelists and fraudulent voters; in Massachusetts voters are required to be able to read English. The number of members to which each State is entitled is determined by the census taken every 10 years. Under the census of 1890 the total number of Representatives was fixed at 357; and under that of 1900, Congress in January, 1901, fixed the number at 386, the act to take effect on March 3, 1903. The apportionment of these Representatives among the several States was as follows: Arkansas, 7; California, 8; Colorado, 3; Connecticut, 5; Delaware, 1; Florida, 3; Georgia, 11; Idaho, 1; Illinois, 25; Indiana, 13 Iowa, 11; Kansas, 8; Kentucky, 11; Louisiana, 7; Maine, 4; Maryland, 6; Massachusetts, 14; Michigan, 12; Minnesota, 9; Mississippi, 8; Missouri, 16; Montana, 1; Nebraska, 6; Nevada, 1; New Hampshire, 2; New Jersey, 10; New York, 37; North Carolina, 10; North Dakota, 2; Ohio, 21; Oregon, 2; Pennsylvania, 32; Rhode Island, 2; South Carolina, 7; South Dakota, 2; Tennessee, 10; Texas, 16; Utah, 1; Vermont, 2; Virginia, 10; Washington, 2; West Virginia, 5; Wisconsin, 11; and Wyoming, 1. This apportionment gave Arkansas, California, Colorado, Connecticut, Florida, Illinois, Louisiana, Massachusetts, Minnesota, Mississippi, Missouri, New Jersey, New York, North Carolina, North Dakota, Pennsylvania, Texas, Washington, West Virginia, and Wisconsin additional

representation; the other States retaining their numbers under the census of 1890.

PRESIDENTS PRO TEM. OF THE SENATE.

| Years. | Name. | State. |
|---|---|---|
| 1789-1792 | John Langdon | N. H. |
| 1792 | Richard H. Lee | Va. |
| 1792-1794 | John Langdon | N. H. |
| 1794-1795 | Ralph Izard | S. C. |
| 1795-1796 | Henry Tazewell | Va. |
| 1796-1797 | Samuel Livermore | N. H. |
| 1797 | William Bingham | Pa. |
| 1797 | William Bradford | R. I. |
| 1797-1798 | Jacob Read | S. C. |
| 1798 | Theo. Sedgwick | Mass. |
| 1798-1799 | John Laurence | N. Y. |
| 1799 | James Ross | Pa. |
| 1799-1800 | Samuel Livermore | N. H. |
| 1800 | Uriah Tracy | Ct. |
| 1800-1801 | John E. Howard | Md. |
| 1801 | James Hillhouse | Ct. |
| 1801-1802 | Abraham Baldwin | Ga. |
| 1802-1803 | Stephen R. Bradley | Vt. |
| 1803-1804 | John Brown | Ky. |
| 1804-1805 | Jesse Franklin | N. C. |
| 1805 | Joseph Anderson | Tenn. |
| 1805-1808 | Samuel Smith | Md. |
| 1808-1809 | Stephen R. Bradley | Vt. |
| 1809 | John Milledge | Ga. |
| 1809-1810 | Andrew Gregg | Pa. |
| 1810-1811 | John Gaillard | S. C. |
| 1811-1812 | John Pope | Ky. |
| 1812-1813 | Wm. H. Crawford | Ga. |
| 1813-1814 | Jos. B. Varnum | Mass. |
| 1814-1818 | John Gaillard | S. C. |
| 1818-1819 | James Barbour | Va. |
| 1820-1826 | John Gaillard | S. C. |
| 1826-1828 | Nathaniel Macon | N. C. |
| 1828-1832 | Samuel Smith | Md. |
| 1832 | L. W. Tazewell | Va. |
| 1832-1834 | Hugh L. White | Tenn. |
| 1834-1835 | Geo. Poindexter | Miss. |
| 1835-1836 | John Tyler | Va. |
| 1836-1841 | William R. King | Ala. |
| 1841-1842 | Samuel L. Southard | N. J. |
| 1842-1846 | W. P. Mangum | N. C. |
| 1846-1849 | D. R. Atchison | Mo. |
| 1850-1852 | William R. King | Ala. |
| 1852-1854 | D. R. Atchison | Mo. |
| 1854-1857 | Jesse D. Bright | Ind. |
| 1857 | James M. Mason | Va. |
| 1857-1861 | Benj. Fitzpatrick | Ala. |
| 1861-1864 | Solomon Foot | Vt. |
| 1864-1865 | Daniel Clark | N. H. |
| 1865-1867 | Lafayette S. Foster | Ct. |
| 1867-1869 | Benjamin F. Wade | Ohio. |
| 1869-1873 | Henry B. Anthony | R. I. |
| 1873-1875 | M. H. Carpenter | Wis. |
| 1875-1879 | Thomas W. Ferry | Mich. |
| 1879-1881 | A. G. Thurman | Ohio. |
| 1881 | Thomas F. Bayard | Del. |
| 1881-1883 | David Davis | Ill. |
| 1883-1885 | Geo. F. Edmunds | Vt. |
| 1885-1887 | John Sherman | Ohio. |
| 1887-1891 | John J. Ingalls | Kan. |
| 1891-1893 | C. F. Manderson | Neb. |
| 1893-1895 | Isham G. Harris | Tenn. |
| 1895-1911 | William P. Frye | Me. |
| 1911- | Jacob H. Gallinger | N. H. |

SPEAKERS OF THE HOUSE OF REPRESENTATIVES.

| Years. | Name. | State. |
|---|---|---|
| 1789-1791 | F. A. Muhlenburg | Pa. |
| 1791-1793 | Jonathan Trumbull | Ct. |
| 1793-1795 | F. A. Muhlenburg | Pa. |
| 1795-1799 | Jonathan Dayton | N. J. |
| 1799-1801 | Theo. Sedgwick | Mass. |
| 1801-1807 | Nathaniel Macon | N. C. |
| 1807-1811 | Joseph B. Varnum | Mass. |
| 1811-1814 | Henry Clay | Ky. |
| 1814-1815 | Langdon Cheves | S. C. |
| 1815-1820 | Henry Clay | Ky. |
| 1820-1821 | John W. Taylor | N. Y. |

United States of America

| Years. | Name. | State. |
|---|---|---|
| 1821-1823 | Philip P. Barbour | Va. |
| 1823-1825 | Henry Clay | Ky. |
| 1825-1827 | John W. Taylor | N. Y. |
| 1827-1834 | Andrew Stevenson | Va. |
| 1834-1835 | John Bell | Tenn. |
| 1835-1839 | James K. Polk | Tenn. |
| 1839-1841 | R. M. T. Hunter | Va. |
| 1841-1843 | John White | Ky. |
| 1843-1845 | John W. Jones | Va. |
| 1845-1847 | John W. Davis | Ind. |
| 1847-1849 | Robert C. Winthrop | Mass. |
| 1849-1851 | Howell Cobb | Ga. |
| 1851-1855 | Linn Boyd | Ky. |
| 1855-1857 | Nathaniel P. Banks | Mass. |
| 1857-1859 | James L. Orr | S. C. |
| 1859-1861 | Wm. Pennington | N. J. |
| 1861-1863 | Galusha A. Grow | Pa. |
| 1863-1869 | Schuyler Colfax | Ind. |
| 1869-1875 | James G. Blaine | Me. |
| 1875-1876 | Michael C. Kerr | Ind. |
| 1876-1881 | Samuel J. Randall | Pa. |
| 1881-1883 | John W. Keifer | Ohio. |
| 1883-1889 | John G. Carlisle | Ky. |
| 1889-1891 | Thomas B. Reed | Me. |
| 1891-1895 | Charles F. Crisp | Ga. |
| 1895-1899 | Thomas B. Reed | Me. |
| 1899-1903 | David B. Henderson | Ia. |
| 1903-1911 | Joseph G. Cannon | Ill. |
| 1911- | Champ Clark | Mo. |

For Judiciary, see JUDICIARY: SUPREME COURT.

*Army.*—Under present laws the total enlisted strength of the army at any one time is limited to a maximum of 100,000. The force in active service in 1911 comprised 15 regiments of cavalry, with 765 officers and 12,775 enlisted men; 6 regiments of field artillery, with 236 officers and 5,220 men; coast artillery corps, with 170 companies, 672 officers, and 19,321 men; 30 regiments of infantry, with 1,530 officers and 25,231 men; 3 battalions of engineers, officered by the corps of engineers, and with 2,002 men; a regiment of infantry in Porto Rico, with 32 officers and 576 men; a force of 52 companies of native scouts in the Philippines, with 180 officers and 5,732 men; and special services, with 11,777 men. Active staff and line officers numbered 4,453; enlisted men, exclusive of the Hospital Corps and the Philippine force, 76,911.

The Military Divisions and Departments in 1911 were:

*Department of the East.*—New England, New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, West Virginia, Virginia, Porto Rico and islands and keys adjacent thereto; headquarters, Governor's Island, N. Y. Commander, Maj.-Gen. F. D. Grant.

*Department of the Gulf.*—North Carolina, South Carolina, Tennessee, Georgia, Florida, Alabama, Louisiana and Mississippi; headquarters, Atlanta, Ga. Commander, Brig.-Gen. A. L. Mills.

*Department of the Lakes.*—Wisconsin, Michigan, Illinois, Indiana, Ohio and Kentucky; headquarters, Chicago, Ill. Commander, Brig.-Gen. C. L. Hodges.

*Department of the Missouri.*—Missouri, Iowa, Nebraska, South Dakota, Wyoming (except Yellowstone National Park) and

United States of America

Kansas; headquarters, Omaha, Neb. Commander, Brig.-Gen. F. A. Smith.

*Department of Dakota.*—Minnesota, North Dakota, Montana, and the Yellowstone National Park; headquarters, St. Paul, Minn. Commander, Brig.-Gen. Walter Howe.

*Department of Texas.*—Texas, Arkansas and Oklahoma; headquarters, San Antonio, Tex. Commander, Brig.-Gen. R. W. Hoyt.

*Department of the Colorado.*—Colorado, Utah, Arizona and New Mexico; headquarters, Denver, Col. Commander, Brig.-Gen. Earl D. Thomas.

*Department of California.*—California, Nevada and Hawaii; headquarters, San Francisco, Cal. Commander, Brig.-Gen. T. H. Bliss.

*Department of the Columbia.*—Washington, Oregon, Idaho (excepting the Yellowstone National Park) and Alaska; headquarters, Vancouver Barracks, Wash. Commander, Brig.-Gen. Marion P. Maus.

*Philippines Division.*—Embracing Departments of Luzon. Visayas and Mindanao; headquarters, Manila, P. I. Commander, Maj.-Gen. J. Franklin Bell.

*Department of Luzon.*—Headquarters, Manila, P. I. Commander, Brig.-Gen. R. D. Potts.

*Department of the Visayas.*—Headquarters, Iloilo, P. I. Commander, Brig.-Gen. Daniel H. Brush.

*Department of Mindanao.*—Headquarters Zamboanga, P. I. Commander, Brig.-Gen. John J. Pershing.

The organized and unorganized militia of the country was distributed among the States and Territories as follows:

| | States and Territories. | General and General Staff Officers. | Regimental and Comp. Officers. | Total Commissioned. | Enlisted men. | Tot'l Commis'd and Enlisted (Org'ized Militia). | Reserve Militia (Unorganized). |
|---|---|---|---|---|---|---|---|
| 1 | Alabama | 50 | 190 | 240 | 3,134 | 3,374 | 350,000 |
| 2 | Arizona | 5 | 43 | 48 | 568 | 616 | 40,000 |
| 3 | Arkansas | 35 | 101 | 136 | 1,534 | 1,670 | 325,000 |
| 4 | California | 31 | 164 | 199 | 2,777 | 2,976 | 309,546 |
| 5 | Colorado | 17 | 59 | 76 | 887 | 963 | 131,000 |
| 6 | Connecticut | 28 | 152 | 180 | 2,441 | 2,621 | 124,991 |
| 7 | Delaware | 7 | 37 | 44 | 336 | 380 | 32,000 |
| 8 | District of Columbia | 30 | 84 | 115 | 1,664 | 1,779 | 62,634 |
| 9 | Florida | 25 | 76 | 101 | 1,177 | 1,278 | 264,535 |
| 10 | Georgia | 34 | 203 | 237 | 2,686 | 2,923 | 500,000 |
| 11 | Hawaii | 12 | 35 | 47 | 572 | 619 | 8,000 |
| 12 | Idaho | 8 | 49 | 57 | 560 | 617 | 30,000 |
| 13 | Illinois | 75 | 441 | 520 | 5,746 | 6,266 | 1,031,488 |
| 14 | Indiana | 32 | 147 | 179 | 2,106 | 2,285 | 638,560 |
| 15 | Iowa | 26 | 197 | 223 | 2,664 | 2,887 | 302,000 |
| 16 | Kansas | 30 | 103 | 133 | 1,565 | 1,698 | 350,000 |
| 17 | Kentucky | 28 | 112 | 140 | 1,712 | 1,852 | 336,000 |
| 18 | Louisiana | 16 | 112 | 127 | 1,692 | 1,819 | 400,000 |
| 19 | Maine | 14 | 102 | 116 | 1,266 | 1,382 | 103,375 |
| 20 | Maryland | 27 | 130 | 157 | 1,944 | 2,101 | 180,000 |
| 21 | Massachusetts | 92 | 349 | 442 | 5,403 | 5,845 | 533,264 |
| 22 | Michigan | 42 | 161 | 203 | 2,703 | 2,906 | 705,000 |
| 23 | Minnesota | 42 | 166 | 207 | 2,598 | 2,805 | 221,000 |
| 24 | Mississippi | 40 | 101 | 141 | 1,422 | 1,563 | 325,000 |
| 25 | Missouri | 49 | 205 | 254 | 3,262 | 3,516 | 650,000 |
| 26 | Montana | 8 | 34 | 42 | 515 | 551 | 37,000 |
| 27 | Nebraska | 29 | 88 | 117 | 953 | 1,070 | 130,000 |
| 28 | Nevada(*a*) | ... | ... | .... | .... | .... | 19,000 |
| 29 | New Hampshire | 21 | 68 | 89 | 1,154 | 1,243 | 40,000 |
| 30 | New Jersey | 105 | 255 | 360 | 3,955 | 4,315 | 559,456 |
| 31 | New Mexico | 11 | 44 | 55 | 711 | 766 | 68,000 |
| 32 | New York | 198 | 796 | 994 | 15,295 | 16,289 | 1,436,275 |
| 33 | North Carolina | 44 | 177 | 221 | 2,174 | 2,395 | 290,000 |
| 34 | North Dakota | 11 | 59 | 70 | 678 | 748 | 60,000 |
| 35 | Ohio | 87 | 480 | 517 | 5,776 | 6,293 | 1,085,110 |
| 36 | Oklahoma | 11 | 48 | 59 | 898 | 957 | 140,000 |
| 37 | Oregon | 21 | 91 | 112 | 1,411 | 1,523 | 130,000 |
| 38 | Pennsylvania | 104 | 218 | 722 | 9,558 | 10,280 | 1,081,845 |
| 39 | Rhode Island | 25 | 84 | 109 | 989 | 1,098 | 90,000 |
| 40 | South Carolina | 31 | 152 | 183 | 1,748 | 1,931 | 213,274 |
| 41 | South Dakota | 16 | 69 | 76 | 690 | 766 | 70,000 |
| 42 | Tennessee | 25 | 106 | 131 | 1,409 | 1,540 | 425,000 |
| 43 | Texas | 43 | 177 | 220 | 2,804 | 3,024 | 500,000 |
| 44 | Utah | 14 | 36 | 50 | 387 | 437 | 30,000 |
| 45 | Vermont | 7 | 60 | 67 | 850 | 917 | 46,500 |
| 46 | Virginia | 27 | 160 | 187 | 2,311 | 2,498 | 250,000 |
| 47 | Washington | 9 | 69 | 78 | 929 | 1,007 | 200,000 |
| 48 | West Virginia | 17 | 90 | 107 | 1,280 | 1,387 | 175,000 |
| 49 | Wisconsin | 23 | 169 | 192 | 2,888 | 3,080 | 438,472 |
| 50 | Wyoming | 7 | 44 | 51 | 665 | 716 | 25,000 |
| | Total | 1,695 | 7,438 | 9,133 | 112,447 | 121,580 | 15,493,125 |

(*a*) No organized militia.

*Navy.*—At the beginning of 1911 the United States ranked second among naval powers in the number of first-class cruisers and third in modern battleships. Of effective ships, there were 24 modern battleships, 9 older battleships, 15 first-class cruisers, 3 second-class cruisers, 14 third-class cruisers, 21 gunboats, 10 monitors, 40 destroyers, 33 torpedo boats and 35 submarines, with a total of 51,296 officers and men. In Dreadnaught tonnage Great Britain led the world, with 9 ships of 202,950 total tonnage. The United States was second, with 8 ships of 189,650 total tonnage, and Germany third, with 6 ships of 127,500 total tonnage, the United States and Great Britain own within 86,500 tons of half. In battleship practice shooting the range has been changed from 6,500 yards to more than 10,000 yards, and at the latter distance records were made by the 16 battleships of the Atlantic fleet in 1910 that astonished the naval world. See DREADNAUGHTS.

*Naval Militia.*—In 1911 the naval militia of the United States was organized in 20 States and the District of Columbia, as follows:

| State. | Commis'd | Warrant | Petty | Men. | Total. |
|---|---|---|---|---|---|
| | Offs. | Offs. | Offs. | | |
| California .... | 44 | 6 | 107 | 428 | 585 |
| Connecticut .. | 16 | 5 | 42 | 161 | 224 |
| Dist. Columbia | 14 | ..... | 50 | 93 | 157 |
| Georgia ..... | 3 | ..... | 6 | 38 | 47 |
| Illinois ..... | 50 | ..... | 114 | 473 | 637 |
| Indiana ..... | 18 | ..... | 41 | 125 | 184 |
| Louisiana .... | 46 | 3 | 76 | 477 | 602 |
| Maine ..... | 3 | ..... | 16 | 50 | 69 |
| Maryland .... | 17 | 5 | 110 | 162 | 294 |
| Massachusetts. | 40 | ..... | 115 | 370 | 525 |
| Michigan ..... | 41 | ..... | 66 | 233 | 340 |
| Minnesota .... | 11 | ..... | 17 | 106 | 134 |
| Missouri ..... | 10 | 1 | 18 | 77 | 106 |
| New Jersey .. | 23 | 2 | 65 | 260 | 350 |
| New York ... | 52 | ..... | 90 | 678 | 820 |
| N. Carolina .. | 32 | 4 | 70 | 258 | 364 |
| Ohio ..... | 16 | ..... | 29 | 205 | 250 |
| Pennsylvania.. | 7 | ..... | 16 | 89 | 112 |
| Rhode Island. | 15 | 2 | 49 | 160 | 226 |
| S. Carolina .. | 19 | ..... | 37 | 150 | 206 |
| Wisconsin ... | 8 | ..... | ..... | 61 | 69 |
| Total..... | 485 | 28 | 1,134 | 4,654 | 6,301 |

*History.*—The territories now occupied by the United States of America, though they were probably visited on their N. E. coast by Norse navigators about the year 1,000, continued the sole possession of numerous tribes of Indians till the rediscovery of America by Columbus in 1492. In 1498 an English expedition, under the command of Sebastian Cabot, explored the E. coast of America, from Labrador to Virginia, perhaps to Florida. In 1513 Juan Ponce de Leon landed near St. Augustine, Fla., and explored a portion of that region in a romantic search for the Fountain of Youth. In 1520 some Spanish vessels from San Domingo were driven upon the coast of Carolina. In 1521, by the conquests of Cortez and his followers, Mexico, including Texas, New Mexico, and California, became a province of Spain. In 1539-1542 Ferdinand de Soto led a Spanish expedition from the coast of Florida across Alabama, and discovered the Mississippi river. In 1584-1585 Sir Walter Raleigh sent two expeditions to the coast of North Carolina and attempted to form settlements on Roanoke Island. A Spanish settlement was made at St. Augustine, Florida, in 1565; Jamestown, Va., was settled in 1607; New York, then called the New Netherlands, in 1613; Plymouth, Mass., in 1620. A large part of the country on the Great Lakes and on the Mississippi was explored by La Salle in 1682; and settlements were made by the French at Kaskaskia and Arkansas post in 1685, and at Mobile and Vincennes in 1702.

The first effort at a union of colonies was in 1643, when the settlements in Massachusetts, New Hampshire, Rhode Island, and Connecticut formed a confederacy for mutual defense against the French, Dutch, and Indians under the title of "The United Colonies of New England." In 1761 the enforcement of the Navigation Act against illegal traders, by general search warrants, caused a strong excitement against the English government, especially in Boston. The British admiralty enforced the law; and many vessels were seized, and the colonial trade with the West Indies was annihilated. In 1765 the passing of an act of Parliament for collecting a colonial revenue by stamps caused general indignation, and led to riots. Patrick Henry, in the Virginia Assembly, denied the right of Parliament to tax America, and eloquently asserted the dogma, "No taxation without representation." The first impulse was to unite against a common danger; and the first Colonial Congress of 29 delegates, representing nine colonies, made a statement of grievances and a declaration of rights. In 1766 the Stamp Act was repealed, but the principle of colonial taxation was not abandoned. In 1773 the duties were repealed, excepting 3d. a pound on tea.

It was now a question of principle, and from N. to S. it was determined that this tax should not be paid. Some cargoes were stored in damp warehouses and spoiled; some sent back, and in Boston a mob disguised as Indians threw it into the harbor. England then determined to enforce the government of the crown and Parliament over the colonies, and a fleet with 10,000 troops was sent to America, which led to the battle of Lexington, and the beginning of the Revolutionary War, April 19, 1775. The news that the British troops had been compelled to beat a hasty retreat summoned 20,000 men to the vicinity of Boston. A Congress of the colonies assembled at Philadelphia, and appointed George Washington Commander-in-Chief of an army of 20,000

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men. The battle of Bunker Hill was fought at Charlestown, June 17, 1775, between 1,500 Americans, who had hastily entrenched themselves, and 2,000 British soldiers. When the Americans had exhausted their ammunition they were ordered to retreat; but as they had only lost 115 killed, 305 wounded, and 32 prisoners, while the loss on the British side was at least 1,054, the encounter had all the moral effect of a victory. After a winter of great privations the British were compelled to evacuate Boston, carrying away in their fleet to Halifax 1,500 loyal families. An army of 55,000 men, including 17,000 German mercenaries (Hessians), was sent under the command of Sir William Howe to put down this "wicked rebellion."

On June 7, 1776, Richard Henry Lee, of Virginia, offered a resolution in Congress, declaring that the united colonies are, and ought to be, free and independent States; that they are absolved from all allegiance to the British crown; and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved." This resolution was adopted by the votes of 9 out of 13 colonies, and brought about the celebrated "Declaration of Independence," which on July 4, 1776, received the assent of the delegates of the colonies. They adopted the general title of the "United States of America," with a population of about 2,500,000. From the battle of Lexington, April 19, 1775, to the surrender of Yorktown, Oct. 19, 1781, in 24 engagements, including the surrender of two armies, the British losses in the field were not less than 25,000 men, while those of the Americans were about 8,000.

After the peace, concluded Sept. 3, 1783, the independence of the United States was acknowledged by foreign powers, and in 1787 the present Constitution was ratified. George Washington and John Adams, standing at the head of the Federalist party, were elected President and Vice-President of the United States. The War of 1812 grew out of the fact that England declined to put a stop to the abuse of impressing American citizens into the British navy, the attention of Congress having been called to 6,000 instances in 1811. In 1814 the Federalists of New England held a convention at Hartford in opposition to the war and the administration of President Madison, and threatened a secession of the New England States, as having to defend themselves as it was. The war was terminated by the treaty of Ghent, Dec. 24, 1814, though the English suffered a disastrous defeat at New Orleans, Jan. 8, 1815, nearly a month after peace had been concluded between England and America. The Democratic-Republican party having brought the war to a satisfactory conclusion, the Federalists disappeared; and in 1817 James Monroe was elected to the presidency.

At the period of the Revolution slavery existed in all the States except Massachusetts, but it had gradually been abolished in the Northern and Middle States, except Delaware, and excluded from the new States between the Ohio and the Mississippi rivers by the terms on which the territory had been surrendered by Virginia to the Union. The two sections had already entered on a struggle to maintain the balance of power against each other. After an exciting contest in 1820 Missouri was admitted with a resolution (the "Missouri Compromise") that in future no slave State should exist N. of the parallel of lat. 36° 30′ N. In 1826 two of the founders of the republic, John Adams and Thomas Jefferson, died on July 4, the anniversary of the Declaration of Independence. In 1832 an Indian war, called the Black Hawk War, broke out in Wisconsin; but the passing of a high protective tariff act by Congress caused a more serious trouble. The State of South Carolina declared the act unconstitutional. A collision seemed imminent, when the affair was settled by a compromise bill, introduced by Henry Clay, providing for a gradual reduction of duties till 1843, when they should not exceed 20 per cent., ad valorem. In 1835 the Seminole War broke out in Florida, and a tribe of Indians, insignificant in numbers, under the crafty leadership of Osceola, kept up hostilities for years at a cost to the United States of several thousand men, and some $50,000,000.

In 1837 Martin Van Buren succeeded General Jackson in the presidency. His term was a stormy one, from the great financial crisis of 1837, which followed a period of currency expansion and wild speculation. All the banks suspended payment, and the great commercial cities threatened insurrection. In 1840 Gen. William H. Harrison was elected President, but died in 1841, a month after his inauguration. He was succeeded by John Tyler, during whose administration the N. E. boundary question, which nearly occasioned a war with England, was settled by Daniel Webster, Secretary of State, and Lord Ashburton. In 1845 Texas was formally annexed to the United States, and James K. Polk, of Tennessee, succeeded Mr. Tyler in the presidency. M. Almonte, the Mexican minister at Washington, protested against the annexation of Texas as an act of warlike aggression, which brought about the Mexican War in 1846.

In 1847 the Mexicans were defeated by General Taylor at Buena Vista; Vera Cruz was taken by storm, and General Scott won the great battle of Cerro Gordo. In 1848 peace was signed, and by the treaty of Guadaloupe the United States obtained the

cession of New Mexico and Upper California, the United States paying Mexico, $15,000,000, and assuming the payment of the claims of American citizens against Mexico. In 1849 General Taylor, the "Rough and Ready" victor of Buena Vista, became President, with Millard Fillmore as Vice-President. In September of the same year California adopted a constitution which prohibited slavery. The election of Franklin Pierce in 1852 against General Scott was a triumph of the Democratic States' Rights and Southern party. A brutal assault on Charles Sumner, United States Senator from Massachusetts, by Preston Brooks, in consequence of a violent speech on Southern men and institutions, increased the excitement of both sections. In 1856 the Republicans, composed of the Northern Free-soil and Abolition parties, nominated John C. Fremont for the presidency, but James Buchanan, the Democratic candidate, received the election, with John C. Breckenridge as Vice-President. In Oct., 1859, John Brown, known in Kansas as "Ossawatomie Brown," who planned and led an expedition for freeing the negroes in Virginia, was captured, and executed Dec. 2, by the authorities of Virginia. His body was taken to his home in New York for burial, and he was regarded by the Abolition party as a martyr.

In 1860 the Southern delegates withdrew from the convention at Charleston, and two Democratic candidates were nominated, Stephen A. Douglas and John C. Breckinridge. The Republicans nominated Abraham Lincoln, and at the election of November, 1860, Mr. Lincoln received every Northern vote in the electoral college, except three of New Jersey, 180 votes. The South lost no time in acting on what her statesmen had declared would be the signal of their withdrawal from the Union. Four years of civil war ended in their being compelled to remain in it. In 1864 Mr. Lincoln was re-elected, and on March 4, 1865, commenced his second term, with Andrew Johnson as Vice-President. On April 14, 1865, while the North was rejoicing over the capture of Richmond and the surrender of the Confederate armies, the President was assassinated at a theater in Washington by John Wilkes Booth. The assassin was pursued and killed, and several of his accomplices were tried and executed. Andrew Johnson became President. Jefferson Davis, President of the Confederacy, fled after the surrender of Richmond; he was captured in Georgia, and released without trial in 1867.

An amendment to the Constitution, forever abolishing slavery in the States and Territories of the Union, was declared ratified by two-thirds of the States, Dec. 18, 1865. The vast change in the organization of the republic made in this new fundamental law was completed by the 14th and 15th Amendments, passed in 1868 and 1870, which gave to the former slaves all the rights and privileges of citizenship. The seceded States were readmitted to the Union on condition of their adhesion to the Constitution as thus amended. Owing to the reconstruction policy after the civil war differences arose between President Johnson and the Republican leaders in both houses of Congress. This antagonism finally led to the resolution of the House of Representatives, passed Feb. 24, 1868, to impeach the President "of high crimes and misdemeanors." President Johnson, however, was acquitted, as the prosecution lacked one vote of the two-thirds vote necessary for conviction. Gen. Ulysses S. Grant was elected President in 1868, and inaugurated March 4, 1869, with Schuyler Colfax as Vice-President. He was elected in 1872 for a second term with Henry Wilson as Vice-President. The Geneva Court of Arbitration gave its decree in favor of the United States in 1872, while the San Juan Boundary dispute with Great Britain was settled in favor of the United States by the Emperor of Germany in the same year. The outrages of a secret organization known as the Ku-Klux-Klan, in the Southern States, necessitated the passing of an act in 1871 giving cognizance of such offenses to the United States courts.

The year 1876, memorable in the annals of the republic as the 100th anniversary of the Declaration of Independence, was celebrated by a great Centennial Exhibition at Philadelphia. The presidential election of the same year was so closely contested that Congress appointed a special tribunal, selected from the Senate, the House of Representatives, and the justices of the Supreme Court, to examine the election returns. The decision was in favor of Rutherford B. Hayes, the Republican candidate, who was declared to have been elected President, and inaugurated March 4, 1877. In 1879 specie payments were resumed throughout the United States, after a suspension of 17 years. In 1880 the Republican National Convention at Chicago nominated Gen. James A. Garfield, of Ohio, and Chester A. Arthur, of New York, for President and Vice-President. The Democratic National Convention was held in Cincinnati, O., and Gen. Winfield S. Hancock and William H. English, of Indiana, were selected as candidates. The result of the election was in favor of the Republicans. General Garfield was inaugurated, March 4, 1881. On July 2, 1881, he was shot by a disappointed office seeker, Charles J. Guiteau, and after more than two months of suffering died from the effects of the wound at Elberon, N. J., Sept. 19, 1881. His loss was lamented by the whole nation. He was succeeded by Vice-President Chester A. Arthur, who served the remainder of the term.

In 1884 the Democratic party nominated

Grover Cleveland and Thomas A. Hendricks for the presidency and vice-presidency, while the Republicans put up James G. Blaine and John A. Logan. The election resulted in the choice of Grover Cleveland and Thomas A. Hendricks, who were inaugurated March 4, 1885. The death of General Grant, on July 23, 1885, was a notable event, and one that profoundly moved the whole nation. Mr. Hendricks died Nov. 25, 1885, and John Sherman, by virtue of his election as president *pro tem.* of the Senate, became his successor. Mr. Cleveland's administration was in the main uneventful, though the country was disturbed by widespread and obstinate conflicts between labor and capital. The silver coinage question, the reform of the civil service, the Mormon question, the labor problem, and the Pan-Electric controversy were the issues of the hour. The presidential campaign of 1888 had the tariff question for its main issue. Mr. Cleveland was renominated by the Democracy, with Allan G. Thurman for Vice-President, and Benjamin Harrison, of Indiana, grandson of the ninth President of the United States, and Levi P. Morton, for Vice-President, were nominated by the Republicans. The latter were elected, the electoral vote standing 233 to 168. In 1889 four new States were added to the Union, namely, Montana, North Dakota, South Dakota, and Washington, and the Territory of Oklahoma was carved out of the Indian Territory. In 1890 Wyoming and Idaho were admitted to statehood.

In 1892 Mr. Harrison was renominated by the Republicans for President, and Whitelaw Reid, of New York, for Vice-President. The Democrats nominated Mr. Cleveland for President, and Adlai E. Stevenson, of Illinois, for Vice-President. Cleveland and Stevenson were elected by an electoral vote of 277 for the ticket, against 145 for Harrison and Reid, and 22 for Weaver, the candidate of the People's party. The year 1893 was memorable for the monetary depression and hard times throughout the United States, and, to some extent, all over the world. Many thousands of men were out of employment; many financial institutions and business enterprises failed. Almost every form of security depreciated. A great railway strike, accompanied by great destruction of property and some loss of life, occurred on roads centering in Chicago; and others of less magnitude elsewhere. An army of unemployed men made a demonstration by marching across the country, subsisting on popular charity as they went, to the city of Washington, where they hoped to influence legislation by Congress, and action by the executive, to relieve the unemployed. This condition of things was popularly attributed to the administration, and to the Democratic tariff bill that had not yet been substituted for the McKinley bill, but was sure to be passed. As a consequence, in the State and Congressional elections of 1894 the Republicans obtained sweeping victories, and came into power in Congress. The administration was otherwise marked by its maintenance of friendly relations with Spain against the belligerent urgency of a large anti-Spanish party, friendly to Cuban independence; by the extension of the Civil Service; and by the Arbitration Treaty of 1897.

The presidential campaign of 1896 was an unusually exciting one, with seven tickets in the field: Republican, William McKinley and Garret A. Hobart; Democratic, William J. Bryan and Arthur Sewall; Peoples', William J. Bryan and Thomas E. Watson; Prohibition, Joshua Levering and Hale Johnson; National Democratic, John M. Palmer and Simon B. Buckner; Social Labor, Charles H. Matchett and Matthew Maguire; and National (Free-Silver Prohibition), Charles E. Bentley and James H. Southgate. In the election the Republican candidates received 7,104,779 popular and 271 electoral votes, and the fused Democratic and Peoples' candidates 6,502,925 popular and 176 electoral votes. This campaign was characterized by a remarkable revolt in the Democratic party and a fusion of that party with the Populist. (See BRYAN, WILLIAM JENNINGS: MCKINLEY, WILLIAM.)

The great event of this administration was the war successfully waged by the United States against Spain, in 1898; the freeing of Cuba from Spanish dominion; the acquisition by the United States, as a result of the war, of Porto Rico, the Philippine Islands, and Guam, and, by treaty, of Hawaii and the Samoan island of Tutuila; and the formation of a considerable party, known as Anti-Expansionists and Anti-Imperialists. The details of the war are given under CUBA: MANILA BAY, BATTLE OF: PHILIPPINE ISLANDS; PORTO RICO; SANTIAGO: SPANISH-AMERICAN WAR; and the names of persons and places that became prominent in the war.

In the presidential campaign of 1900 there were eight tickets in the field: Republican, William McKinley and Theodore Roosevelt; Democratic, William J. Bryan and Adlai E. Stevenson; Prohibition, John G. Woolley and Henry B. Metcalf; Middle-of-the-Road or Anti-Fusion Peoples', Wharton Barker and Ignatius Donnelly; Social Democratic, Eugene V. Debs and Job Harriman; Social Labor, Joseph F. Malloney and Valentine Remmel; United Christian, J. F. R. Leonard and John G. Woolley; and Union Reform, Seth H. Ellis and Samuel T. Nicholas. The election gave the Republican candidates 7,208,224 popular and 292 electoral votes, and the Democratic candidates, 6,358,789 popular and 155 electoral votes. On Sept. 6, 1901, while attending the Pan-

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American Exposition in Buffalo, N. Y., President McKinley was shot twice by Leon Czolgosz, an anarchist, and died from his injuries on the 14th. Immediately thereafter Vice-President Roosevelt took the oath of office as President. In February-March, 1902, Prince Henry of Prussia, brother of the Emperor of Germany and an admiral in the German navy, visited the United States, taking part in the ceremony of launching a steam yacht built for the emperor, and afterward being the recipient of noteworthy official and social courtesies.

In the presidential campaign of 1904 there were six tickets in the field, viz.: Republican, Theodore Roosevelt and Charles W. Fairbanks; Democratic, Alton B. Parker and Henry G. Davis; Socialist, Eugene V. Debs and Benjamin Hanford; Prohibition, Silas C. Swallow and George W. Carroll; Populist, Thomas E. Watson and Thomas H. Tibbles; and Social Labor, Charles H. Corrigan and William W. Cox. In the election the Republican candidates won by a popular plurality of 2,545,515 votes and an electoral majority of 196. In his administration of seven years President Roosevelt waged a persistent war on trusts and illegal combinations, made vigorous demands for a more efficient and conscientious conduct of public affairs, greatly promoted the conservation of the vast natural resources of the country, with a delicate initiative brought about a termination of the Russo-Japanese war, for which he was awarded the Nobel Peace prize ($40,000), with which he established the Foundation for the Promotion of Industrial Peace, and promulgated numerous innovations, some with startling effect on the business world, which became popularly known as "my policies."

In the campaign of 1908 seven tickets appeared, viz.: Republican, William H. Taft and James S. Sherman; Democratic, William J. Bryan and John W. Kern; Socialist, Eugene V. Debs and Benjamin Hanford; Prohibition, Eugene W. Chaffin and Aaron S. Watkins; Populist, Thomas E. Watson and Samuel Williams; Social Labor, August Gillhaus and Donald L. Munro; and the Independent, Thomas L. Hisgen and John T. Graves. In the election the Republican candidates again won, but by reduced votes, having a popular plurality of 1,269,804 and an electoral majority of 159. During the latter part of President Roosevelt's administration discord broke out in his party, largely influenced by alleged usurpation of authority and arbitrary official acts by the Speaker of Congress, and resulted in dividing the party in Congress into two wings, known as "Insurgents" and "Stand-patters." The disaffection spread rapidly over the country and resulted in a political reaction in various State elections in 1910, which changed the party strength in the National House of Representatives from a Republican majority of 47 to a Democratic majority of 66, and in reducing the Republican majority in the Senate from 28 to 10, for the 62d Congress (1911-1913).

The early part of 1911 developed several features of public concern of more than usual interest. The customary bill for the reapportionment of the National House of Representatives based on the last census (1910) was introduced, and provided for an increase of membership to 433 and the new ratio of representation of 1 to 211,800. An agreement was reached on the long-standing controversy on the fisheries question between the United States, Canada, and Newfoundland, thus averting a proposed submission of the case to The Hague Court of Arbitration. On Feb. 21, President Taft sent to the Senate for ratification a new treaty with Japan, from which was eliminated the clause in the old treaty concerning Japanese immigration to the United States, which had been a constant source of irritation to the Japanese government, and the Senate ratified it on the 24th. With the Democratic ascendency came a loud call for a revision of the tariff, leaders of that party voicing the old slogan: "Tariff for revenue only!" and claiming that American industries were now so thoroughly and soundly established that they no longer needed protection.

Of an international character the most important event was the negotiation of a reciprocity treaty with Canada, a measure that surprised two continents, and elicited widely-divergent criticisms in all quarters. In England its opponents declared the agreement to be the first step toward the annexation of Canada by the United States, yet the British Parliament practically went on record as favoring it by rejecting an amendment to the address in reply to the speech from the throne respecting it by a vote of 324 to 222 on Feb. 9. The same day a motion to delay its consideration was defeated in the Canadian Parliament, and the Minister of Finance announced that it would be ratified subject to favorable action in the United States. On Feb. 14 the bill to make the agreement effective passed the American House of Representatives by a vote of 221 to 92. To lay the annexation ghost, President Taft, Premier Laurier, and the Canadian Parliament severally declared that the sole purpose of the agreement was more reciprocal relations in Canadian-American trade. In the United States the extreme views were that the agreement would prove injurious to the farming interests by lowering the price of their commodities and that it would greatly cheapen the cost of living.

Of a more restricted yet none the less important character were the decisions of the Interstate Commerce Commission, rendered Feb. 23, on the railroad freight rate cases. The Commission held that the rail-

roads had failed to show sufficient reasons for increasing freight rates, and that with more skilful management greater tonnage might be handled without increasing the cost of the service. Proposed advances in class freight rates in official classification territory, aggregating among all the railroads in the territory approximately $27,000,000 a year, were disallowed. In the case involving the increases by the railroads in Western trunk line territory, the Commission also declined to approve the proposed advances in commodity rates.

On May 1, the United States Supreme Court rendered a unanimous decision in favor of the conservation of the country's immense natural resources by the National government, upholding the constitutionality of the establishment of the vast reserves for any National and public purpose, and determining that the National government and not the States has the right to say how the reserves shall be used. The subject was considered in two opinions delivered by Justice Lamar, the basic principle on which he proceeded being that the nation is an owner and has made Congress the chief agent for the disposal of its property. The Constitution gives Congress the power to dispose of and make all needful rules and regulations respecting the territory or property belonging to the United States, and as all the public lands of the nation are held in trust for the people of the whole country, it is for Congress alone to determine how that trust shall be administered.

Early in the year President Taft aroused first, widespread curiosity and then severe criticism by ordering the mobilizing of a large army along the Rio Grande in Texas and the rendezvous of some warships at points in the Gulf of Mexico and the Pacific, whence the coasts of Mexico could be speedily reached. The rapid spread of the insurrection in Mexico, the fighting at points along the river opposite American towns, and especially the killing of American citizens on their own territory by stray bullets from the Mexican side of the frontier, soon, however, satisfied the mass of the American people with the prudential course of the President.

At the time of the present writing the Japanese government had ratified the new treaty with the United States; the proposed reciprocity treaty with Canada was gaining in popular esteem in Canada, Great Britain, and the United States; a proposed general arbitration treaty between the United States and Great Britain was being warmly championed in both countries; the new postal savings banks law, which went into effect at the opening of the year, was more than meeting official expectation; the proposed income-tax amendment to the Constitution only lacked the votes of five States for ratification; and the Aldrich plan for currency reform was being favorably received by American bankers.

**United States Steel Corporation.** The organization of the United States Steel Corporation, by the consolidation of eight of the great steel companies in the country brings under one management the largest aggregation of private commercial and financial interests that a single group of men ever had in hand. One of the organizers is quoted as saying that it is "the broadest, biggest, most gigantic, and most influential combination ever effected." The constituent companies are the Carnegie Company, the American Steel and Wire Company, the Federal Steel Company, the National Tube Company, the National Steel Company, the American Tin Plate Company, the American Steel Hoop Company, and the American Sheet Steel Company.

This organization so far eclipses all previous industrial consolidations that it instantly became a subject of world-wide comment and concern for international, industrial, political, and financial reasons. The principal factor in our exporting supremacy is steel, and the manufacturers of other countries naturally see in this concentration of American steel interests a strengthening of American exporting capacity.

The economic view of the subject is not less interesting in other ways. Every well-organized and well-managed industrial combination has cheapened the cost of production. The statement was made by one of the organizers of this great company that consolidation would save in the single item of middlemen's expenses as much as $80,000,000 a year. Most great industrial organizations also have improved the quality of their product by the employment of more scientific methods than smaller companies have employed, by the utilization of waste materials, and by the multiplication of products. Most of them, too, have cheapened the price of their products to the consumer.

The corporation is so conspicuous by reason of its magnitude that it may possibly become a subject of earnest political discussion, but the probabilities are that its very magnitude will prevent this result. Before the organization was formed, a bill was introduced in the House of Representatives by Mr. Babcock, of Wisconsin, to take off all customs duties on materials or products that affected the corporation. Mr. Babcock is a member of the Ways and Means Committee, a Republican of influence, and Chairman of the National Congressional Campaign Committee. His bill is a reminder that the protective principle has lost much of its old-time prominence and power —lost it by the pressure of events. Our

iron and steel exports in 1900 amounted to $130,000,000. But Mr. Babcock's bill gives hint also of possible political discussion that this organization may provoke.

From a financial point of view the magnitude of the new corporation is bewildering. Its capitalization is $1,146,000,000 — more than a thousand million dollars; and the properties are said now to be yielding large profits on this sum.

**United Workmen, Ancient Order of,** an American beneficial organization, founded in 1868; reported in 1909: Grand lodges, 24; subordinate lodges, 4,500; members, 210,000; benefits paid in the last fiscal year, $5,000,000; benefits paid since organization, $200,000,000.

**Units, Electrical.** Unit of quantity, a coulomb. The quantity of electricity that will liberate .000162 grains of hydrogen from water, or .005232 grains of zinc from a solution of the metal. In this unit, rate or time is taken no account of. Unit of current, an ampere; a current flowing at the rate of one coulomb per second, or liberating .000162 grains of hydrogen, etc., per second. Unit of electromotive force, a volt. The force or difference of potential required to produce, through a wire of one ohm resistance, a current of one ampere. Unit of resistance, the legal unit of resistance, as settled by the International Electrical Congress, at Paris, 1884, is that of a column of pure mercury 106 centimeters long, 1 square millimeter in sectional area at 0° C. The name ohm is now confined to this unit, but was formerly used to denote an older unit chosen by the British Association, which is to the legal ohm as 1.0112 to 1. Unit of capacity, a farad. A condenser has a capacity of one farad when a potential difference of one volt between its two sets of plates charges each of them with one coulomb. Absolute units, the absolute electromotive force unit is a force, and the absolute unit magnetic pole is a pole, which, when placed at a distance of one centimeter, from a similar force or pole, repels it with a force of one dyne. These units are inconveniently small for actual use, thus one volt $= 10^8$ absolute units. Unit of work done, the watt; the rate at which electrical work is done is measured by watts. A watt is the power developed in the circuit, when one ampere of current produces one volt difference of potential at the terminals. Hence this electrical result = one 746th part of one horse-power.

**Univalve,** in zoölogy, a popular name for any of the *Gasteropoda* inclosed in a univalve shell, which may be regarded essentially as a cone, the apex of which is more or less oblique. In the simplest form the conical shape is retained without any alteration, as is the case with the common limpet. In the majority of instances univalves have the conical shell considerably elongated, so as to form a tube, which may retain this shape, but is usually coiled up into a spiral, and this latter form may be regarded as the typical shell of the *Gasteropoda*. In some (as in Vermetus) the coils or whorls are hardly in contact, but more commonly they are so amalgamated that the inner side of each convolution is formed by the preëxisting whorl. When the whorls are coiled round a central axis in the same plane, the shell is said to be discoidal, as in *Planorbis*, but, in most cases, they are wound obliquely round the axis, and the shell is termed turreted, trochoid, or turbinated, fusiform, etc. The animal withdraws into its shell by a retractile muscle, which passes into the foot or is attached to the operculum, its scar or impression being placed in the spiral univalves, on the columella. In the marine univalves two important variations exist in the form of the mouth of the shell. In one group, the *Holostomata*, it is unbroken and entire, and these animals live for the most part on vegetable food; in the other group, the *Siphonostomata*, which are mainly carnivorous, the aperture of the shell is notched in front. Commonly the shell is fusiform; the apix mammillated; the whorls ventricose, strongly ribbed or corrugated, with discontinuous varices, and distinct sutures; the columella is denticulated; the outer lip is internally plicato-dentate; the body whorls are large, and the aperture ovately elliptical.

**Universal Instrument,** a reflecting instrument invented by Prof. Piazzi Smyth. It is a sort of reflecting circle, in which a spirit level with a very small bubble is so placed that by means of a lens and a totally reflecting prism an image of the bubble is formed at the focus of the telescope, and the coincidence of the center of that image with the cross wires shows when the line of collimation is truly horizontal.

**Universalist Church,** a communion holding the doctrine that all men, and also the devil and fallen angels, will be forgiven and will enjoy eternal happiness. This belief is very ancient, and passages implying it may be found in the works of Origen and his followers, Gregory of Nyssa, Chrysostom, etc. It is also said to have constituted part of the creed of the Lollards, Albigenses, and Waldenses. Among the English divines who have held some form of this doctrine are Tillotson, Burnet, and William Law, and more recently the late Professor F. D. Maurice. All Unitarians hold it, and some of the Universalists agree with the Unitarians in rejecting the doctrine of the Trinity. The Universalists ground their reasons for their doctrine in the love of God, who, they say, is only angry with sin, not the sinner, and therefore if the sinner repents even after

death his repentance will restore him to God's favor. The sovereignty of God will be finally vindicated by the ultimte harmony of the moral universe, and the submission of all things in heaven and earth to His righteous will. When righteousness is triumphant peace and happiness will prevail; till then pain and suffering will be instruments to work out the will of God. They profess to prove their doctrine from Scripture, quoting in support of it Matt. xxv: 46, John xvii: 3, I Cor. xv: 22, Phil. ii: 10, Eph. i: 10, Col. i: 19,20, and I Tim. iv: 10. Universalism is better known as a distinct sect in the United States than in England. In 1827 a division arose among the American Universalists concerning punishment after death, some asserting it to be limited, while others denied it altogether. Some separated from the main body and called themselves "The Massachusetts Association of Restorationists." Most of them afterward joined the Free-Will Baptists or the Unitarians, while the others returned to the main body. In 1840 the whole sect divided into two, the Impartialists and the Restorationists. But Universalism is also held by many members of other sects, and practically by all Theists strictly so called. In 1910 there were reported in the Universalist Church in the United States, 890 churches, 730 ministers, and 54,836 members. See UNITARIAN CHURCH.

**Universal Prime Meridian,** in astronomy, the meridian of Greenwich, adopted at an International Conference of scientific men, held at Washington, D. C., in 1883. Till that time nearly every country had its own prime meridian — that of England was Greenwich, and that of France Paris; hence an English and a French ship, meeting at sea, would find that there would be a difference of 2° 20′ between the records of their longitude, since Paris is 2° 20′ E. of Greenwich. The conference decided that this anomaly should be abolished, and that longitude should be reckoned only from the meridian of Greenwich, and that it should count 180° E. and 180° W., so that in future all maps will be constructed on this principle, and ships of every nation meeting at sea, will find themselves in the same degree of longitude.

**Universal Time,** in astronomy, a method of reckoning time for international purposes, agreed on by the International Conference, held at Washington, D. C., in 1883. Universal time is reckoned from mean noon at the UNIVERSAL PRIME MERIDIAN (*q. v.*), the day commencing at midnight, and divided into 24 (instead of into two portions of 12) hours each. Local time will still be used for local purposes; but the method of fixing it will be changed. Since the earth is divided into 360° and the day into 24 hours, every 15° will represent the difference of an hour in time. If the earth be divided into 24 equal parts, at every 15th meridian, and if the local mean noon of such meridians be adopted as the standard noon of all places 7½° each side of it, it will follow that when it is noon at Greenwich and at all places within 7½° of Greenwich, it will be 11 o'clock by local (but still noon by universal) time for all places between 7½° and 22½° W. of Greenwich, and 13 o'clock by local (but still noon by universal) time for all places between 7½° and 22½° E. of Greenwiich, and so on throughout the world. Universal time will be the same universally and local time will differ from it only by even hours, instead of by the various odd minutes by which local standards differ from each other at the present time; while in no case will the difference between standard noon and absolute noon at any place exceed half an hour, since a difference of 7½° of longitude equals a difference of half an hour in time. See STANDARD TIME.

**Universe, Hub of the.** See HUB OF THE UNIVERSE.

**Universities,** though offering analogies to Greek and Roman schools, trace their historic continuity no further than the 12th or, at the most, 8th century A. D. Their germs must be sought in the Karoling schools of France, the Palatine, and Italy, and the Saracen schools of Bagdad and Cordova, in such distinctively professional institutes as Salerno's of medicine, Bologna's of Roman law, and in the Paris lecture rooms of the early schoolmen, Abelard, Roscelin, and William of Champeaux. One science attracts another, and so fresh faculties were added to arts, to medicine, or to law; teaching begets instructors, and these received their stamp of fitness in degrees. Through gradual development from within, aided by charters of kings and Popes from without, schools grew into universities — corporations, that is, of teachers and scholars (*universitates doctorum et scholarium*), though later interpreted "places of universal study" (*studii universitates*).

Their type, first struck at Bologna (1158), Paris (1200), Oxford (12th century), and Cambridge (1229), was reproduced by members of foreign "nations" returning home, as when in 1348 the Paris student Karl IV. founded at Prague the earliest university within his empire; or by emigrant students, as when in 1638 the colonists of Cambridge, Mass., erected Harvard on the lines of the Old-World Cambridge. Again, St. Andrews (1413) owed its establishment to wars that cut off the studious Scotch youth from their Moray College at Paris, and the Reformation, opening religious, as wars political, breaches, called into existence new Protestant universities. Theoretically at least, the aim of every university is the same — instruction

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of youth in liberal culture, primarily to develop school-gained knowledge into science, secondarily to promote its practical application. As knowledge widens, teachers themselves must follow up new paths of study, where English fellowships were meant for their *viaticum;* for as careers are always multiplying, the students' claims on the professors multiply. A perfect university was that at which teachers could teach and all learners who would could learn everything. An impossible ideal this, but let us see how near the various universities approach, how far fall short of it.

No country has so many and so well-attended universities as Germany. These, with the dates of foundation are: Berlin (1810); Bonn (1818); Breslau (1702); Erlangen (1743); Freiburg (1457); Giessen (1607); Göttingen (1734); Greifswald (1456); Halle (1694); Heidelberg (1386); Jena (1558); Kiel (1665); Königsberg (1544); Leipsic (1409); Marburg (1527); Munich (1826); Münster (1631); Rostock (1419); Strassburg (1872); Tübingen (1477); Würzburg (1582).

The average annual expenses of the 10 Prussian universities amount to $1,850,000, of which the State defrays about two-thirds. This is a small sum compared with the result attained — the conferring, namely, of university training on 1 per 2,400 of the entire German population. The possibility of the high standard of this education depends as elsewhere on the state of the schools, and from school every student must bring a *maturitätszeugniss,* answering to the English B. A. degree. This falls outside the university sphere, as also does the *staatsprüfung,* or government examination, which all candidates for the Church, the bar, or medical profession have to pass; so that during his university career a student is left to cultivate knowledge for knowledge' sake. For the degree, of doctor, he has to produce a thesis on some self-chosen subject of research — one reason this of Germany's grand advancement of science; the other being its system of *privat-docenten,* or assistants of the professorate, who, with the professional standard before their eyes, keep the professors themselves up to the mark. Non-residence, cheap living, and the *verbindungen* (student brotherhoods), supplying partly the place of a college system, but unfortunately associated with foolish duels, are among the most striking features of German universities, which, starting with strong Renaissance and Reformation impulses, stiffened awhile into torpid orthodoxy, but thence were roused by the Napoleonic wars.

Austria has nine universities —Vienna (1365); Prague (1348); Pest (1777); Gratz (1827); Innsbruck (1672); Cracow (1401); Lemberg (1817); Czernowitz (1875); and Agram (1877). Vienna and Prague rank high as medical schools; all generally resemble the German universities, but like the English they put great faith in multiplied examinations, a system an English scholar has likened to plucking a plant by the roots to observe its growth. Also on the German model are the universities of Switzerland, Basel (1460); Zürich (1833); Bern (1834); and Geneva (1875); of the Netherlands, Leyden (1575); Gröningen (1614); Utrecht (1636); and Amsterdam (1877); of Belgium, Ghent (1816); Liège (1816); Louvain (1834); and Brussels (1837); and of Scandinavia, Copenhagen (1479); Christiania (1813); Upsala (1417), and Lund (1668).

In Italy there are 17 State universities: Bologna (1158); Padua (1222); Pavia (1361); Turin (1404); Cagliari (1626); Catania (1434); Genoa (1243); Macerata (1290); Messina (1549); Modena (1678); Naples (1224); Palermo (1805); Parma (1512); Pisa (1338); Rome (1303); Sassari (1677); and Siena (1300). There are also four free universities: Camerino (1727); Ferrara (1391); Perugia (1276); and Urbino (1564). Untouched by the Renaissance, these universities, the latest stronghold of Averroism, have fallen from their high mediæval estate, the students of today neglecting letters for such "bread studies" as law and medicine. Signor Bonghi's act of 1875, assimilating them to the German system, was mainly rescinded in the following year, when the examining functions were restored to the various faculties.

France is at present in a transition state. To replace the universities of Paris and 22 other towns, which the Revolution had swept away, a system of higher instruction was founded in 1808, by which every department has its academy and faculties, constituting, with a central examining and degree-granting body at Paris (resembling the London University), the University of France. This system was materially modified by the clerical victory of 1875, by which corporations, associations, etc., are suffered to found free universities, and whose fruits were the six new Catholic universities of Paris, Lille, Angers, Lyon, Poitiers, and Toulouse, with Jesuits for instructors. The law of 1875 was modified by one of 1880, which reserved to the State faculties the exclusive right to confer degrees. A decree of Dec. 28, 1885 created a general council of the faculties, and the creation of universities, each consisting of several faculties, was accomplished in 1892 under the law of July 10, 1890.

In Great Britain are the universities of Oxford, Cambridge, Durham, Aberdeen, Edinburgh, Glasgow, St. Andrews, and Dublin, with 61 immediate and a large number of affiliated colleges, the latter scattered over the British dominion generally. Lon-

don University is only an examining body, with power to grant degrees to candidates who pass its examinations. So also is the Royal University of Ireland.

Russian universities proper are those at St. Petersburg, Moscow, Kazan, Kharkov, Odessa, Kiev, Warsaw, Yuriev, and Tomsk.

Among the universities and colleges in the United States of which there are more than 500 conferring degrees, the following are the most important: Harvard, Cambridge, Mass., founded 1638; William and Mary, Williamsburg, Va., 1693; Yale, New Haven, Conn., 1700; Princeton, Princeton, N. J., 1746; Columbia, New York city, N. Y., 1754; University of Pennsylvania, Philadelphia, 1785; Brown University, Providence, R. I., 1764; Dartmouth, Hanover, N. H., 1769; Rutgers, New Brunswick, N. J., 1770; Wesleyan, Middletown, Conn., 1830; Johns Hopkins, Baltimore, Md., 1876; Amherst, Amherst, Mass., 1821; Williams, Williamstown, Mass., 1793; University of Michigan, Ann Arbor, 1841; Dickinson, Carlisle, Pa., 1783; Washington and Lee, Lexington, Va., 1749; University of Virginia, Charlottesville, 1825; Cornell University, Ithaca, N. Y., 1868; Union, Schenectady, N. Y., 1795; Bowdoin, Brunswick, Me., 1798; Trinity, Hartford, Conn., 1823; University of California, Oakland, 1855; University of Chicago, Chicago, Ill., 1891; Leland Stanford, Jr., California, 1891; and Vanderbilt, Nashville, Tenn., 1875. For details of the principal universities and colleges, see their respective titles.

**Universities Test Act,** an act of the British Parliament (1871) which provides that no one shall be required on taking any degree, except a degree in divinity, from the universities of Oxford, Cambridge, or Durham, to subscribe any article or formulary of faith, or to conform to any religious observance or form of public worship; and the privileges of graduates are to be exercised also independently of doctrinal tests; but no office of the Church of England is open by this Act to any one who is not a member of the Church of England.

**University College,** a college or teaching institution belonging to a university, or such as might belong to a university. The University College, London, is closely connected with London University. The name is given especially to three of the four colleges which are intended to form a Welsh University, viz., the University College of Wales at Aberystwith, University College of South Wales at Cardiff, and the University College of North Wales at Bangor. The students of these colleges, proceeding to degrees, have to go through a course at either London, Dublin, Edinburgh, or Glasgow. At Dundee there is also a university college now connected with St. Andrews University.

**University College, Oxford,** the oldest in the university, founded about 1253, though the exact date of its foundation is doubtful. Its first statutes date from 1280.

**University Extension.** The American Society for the Extension of University Teaching was founded at Philadelphia, in June, 1890, and incorporated in March, 1892. The office is in Philadelphia, Pa. The aim of university extension is: (1) To extend higher education to all classes of people. (2) To extend education through the whole of adult life. (3) To extend thorough methods of study to subjects of every-day interest.

From Philadelphia the movement has extended into many sections of the country, being established mainly, however, in connection with colleges and universities. The most important work, outside of that of the general society in Philadelphia, is carried on under the auspices of the University of Chicago, the Regents of the University of the State of New York, Rutgers College, New Brunswick; the University of Wisconsin, and in California. The various University Extension Societies all publish syllabi in connection with their courses. These contain suggestive outlines of lectures, lists of books, and other matter of interest, and are of value for guiding home reading and study.

During the year 1900–1901 the society arranged for the delivery of 95 courses of lectures at 74 centers. The course attendance at lectures was 24,531 — the largest in the history of the society. The attendance at classes was 10,535. The number of courses for 1900–1901, arranged by States, showing the extent of the society's work geographically, was as follows: Pennsylvania, 43; New York, 21; New Jersey, 21; Maryland, 7; Connecticut, 3. The division by subjects was as follows: History, 23; literature, 35; music and art, 23; ethics and philosophy, 17; economics, political economy, and sociology, 6; science, 1. Some notion of the constantly widening use that is being made of the society's lecturers and of the University Extension system can be had from the following list, which shows the various auspices under which the courses of last year were delivered: Centers primarily or mainly for teachers, 3; centers under the control of Women's Clubs, 11; People's Institute, New York City (for workingmen), 5 courses; Educational Institutions (Schools, Brooklyn Institute, etc.), 9 courses; New York City Board of Education ("free Lectures to the People"), 14 courses; regular University Extension Centers, 53.

**University of Southern California.** See SOUTHERN CALIFORNIA, UNIVERSITY OF.

**University of the Pacific.** See PACIFIC, UNIVERSITY OF THE.

**University of the South,** an educational institution in Sewanee, Tenn.; chartered in 1858; opened in 1868; under the auspices of the Protestant Episcopal Church; has endowment exceeding $250,000; grounds and buildings valued at over $475,000; scientific apparatus, etc., $70,000; volumes in the library, about 30,000; average faculty, 45; average students, 475; graduates, over 800.

**University Settlements,** houses in the poor districts of cities where educated men and women live and come in contact with the working classes for social, educational, and civic purposes. These settlements provide clubs, and offer a home and recreation for wage-earners. Children are taken care of and have many amusements all with a view to waken in them a desire for better things and right living. At the beginning they were simply club houses, in which men and women of university standing proposed to live their lives in the midst of industrial affairs, and all later settlements have been merely modifications of this plan. Besides being an education to the neighborhood, settlements are schools for the workers who go there to learn and investigate in order to get correct data with regard to the problems of poverty. Some settlements organize unions and give them their support. A resident takes part in the local government; serves on committees and boards appointed to look after the health and education of the neighborhood of the settlement. Associations are usually formed to support these settlements, but do not control the work, as the management is under a local committee or resident workers, who pay part of the expenses of the house. The clubs and classes are paid for by the members.

The idea of the university settlement grew out of the London establishment of the Working Men's College in 1860. An Oxford graduate, Edward Denison, in 1867, was the first to make a real home among the poor He lived but a short time, leaving his work when it was still an experiment; but out of his idea of the social elevation of the poor grew a great work — resulting in the establishment of Toynbee Hall (*q. v.*), so called after Arnold Toynbee, who in 1875 worked among the poor of Whitechapel. A memorial was built to him due to the influence of Samuel A. Barnet. Various settlements were started in London and in several cities in Scotland.

The first settlement in the United States was founded in New York city Sept. 1, 1889, by the graduates of several women's colleges. The building, at No. 95 Rivington Street, is located in one of the most crowded tenement districts of the East Side. In the same month a settlement called Hull House was opened in Chicago. On May 14, 1891, another settlement was organized in New York by the graduates of Yale, Columbia, Princeton, and other universities. In October of the same year the graduates of Andover Theological Seminary and other ex-collegians began a similar work in the tenement district of Boston. There are settlements, besides those mentioned, in Brooklyn, Buffalo, Jersey City, Hartford, Philadelphia, Cleveland, Cincinnati, Pittsburg, St. Louis, San Francisco, and many other cities; numbering altogether nearly 100. In 1891 the College Settlements Association was formed, with the purpose of uniting all college women and their friends, who were interested in settlement work.

**Unleavened Bread,** in Church history, bread used in the Roman Church for the celebration of mass and the administration of the Eucharist. The Greeks use leavened bread. In the English Church the rubric directs that the bread "shall be such as is usual to be eaten," and an attempt to revive the use of unleavened bread has been declared illegal.

**Unleavened Bread, Feast of,** a festival so connected with that of the Passover that the two are all but identified (Exod. xii: 11, 17; Ezek. xlv: 21). It celebrated the fact that in the exodus from Egypt on the night when the Passover was killed, the departure of the Israelites was so sudden, that there was no time to bake bread in the usual way with leaven (Exod. xii: 39). The eating of unleavened bread annually at the festival was therefore enjoined as a religious duty, and neither leavened bread nor leaven was to be within the houses of the worshipers during the seven days that the festival continued (Exod. xii: 14–20, xiii: 6, 7).

**Unlimited Liability,** liability to be called on to pay a proportionate share of the entire losses of an unsuccessful company in which one has shares. Joint-stock banks and insurance companies are generally constituted on this basis, but the widespread ruin brought in certain cases on the shareholders has led to many of them being transformed into limited liability companies in States where this can legally be done.

**Unmodified Drift,** in geology, a Canadian glacial deposit laid down while ice action was at its maximum in North America. It is believed to correspond, or at least have a certain relation, to the till of Scotland. Called also hardpan.

**Unona,** in botany, a genus of *Xylopeæ;* shrubs, some of them climbing on trees, with simple, pellucid, dotted leaves, and rather large flowers, with three sepals, six long, thin, flat petals, in two rows, some-

times reduced to a single row of three; numerous, four-sided stamens, and many carpels constricted between the seeds so as to form several one-seeded fruits; known species 17 or 18, from tropical Asia or Africa. The Chinese at Hong Kong make a fine purple dye from the unripe fruit of *U. discolor*. *U. narum* is now *Uvaria narum*.

**Unpaired Eye,** in biology, a functionless eye formed on the invertebrate type, and filling up the space between the brain and the parietal foramen. It was first found in *Sphenodon;* further investigation led to its discovery in all the living *Lactertilia* in which a parietal foraman exists, and has since been traced in fishes by Beard of Freiburg. Thus in the same vertebrate animal are eyes developed on the vertebrate and on the invertebrate type, and formed from the modification of the walls of hollows in, and outgrowths of, the brain. In *Sphenodon,* which has been the subject of most of the investigations, this eye has, in section, the shape of a cone, the base of which fills the foramen, while the pineal stalk is connected with the apex. The walls of the optic vesicle are divided into an anterior and a posterior part, the first forming the lens and the other the sensitive structures, all nourished by a blood-vessel. The lens is apparently directly the product of the brain wall itself. The retinal elements are arranged in the manner typical of invertebrates — the rods lie on the inner side, bounding the cavity of the optic vesicle, the nerve entering posteriorly, and not spreading out in front of the rods. In all living forms this eye is in a state of greater or less degeneration, but it was most probably functional in the labyrinthodonts in which the parietal foramen was very large, and had its sides corrugated, as if for the attachment of muscles.

**Unst,** the extreme N. of the Shetland Islands; length, 10 miles; average breadth, between 3 and 4 miles. The soil is tolerably fertile, the pasture grounds afford feeding for sheep, but fishing is the chief industry.

**Unstratified Rocks,** in geology, rocks not deposited in strata, beds, or layers, but occurring in masses, sometimes breaking through or overlapping the stratified rocks in their vicinity. They comprehend the volcanic and plutonic rocks.

**Unter-Ammergau.** See AMMERGAU OBER and UNTER.

**Unterwalden,** one of the four "Forest Cantons" of Switzerland, forms part of the hill country which surrounds the Lake of Lucerne; area, 295 square miles; pop. (1905) 28,615. Unterwalden is divided into two parts, Upper and Lower; the capital of the Nidwald is Stanz, and of the Obwald Sarnen.

**Unukalkay,** or **Unakalkay,** in astronomy, the chief star of the constellation Serpens (*alpha* Serpentis). It is between the second and third magnitude, and of a pale yellow color. Called by mediæval astrologers *Cor Serpentis.*

**Unyoro,** a State of Central Africa, now included in Uganda; near the Albert Nyanza, with a population of about 1,500,000.

**Upanishads,** in Hindu sacred literature, the name given to the Vedic speculative treatises which were full of attempts to solve problems connected with the universe and the nature and destiny of man. They are 108 or more in number, each Veda having a certain number of upanishads connected with it. They constitute part of the Brahmanas or commentaries belonging to the Veda, presenting the Vedic doctrine in a comprehensive form, and being of a more dogmatic character than the rest of the Brahmanas. They vary in date like the Brahmanas, which extend, according to Max Müller, from 800 to 600 B. C All Indian philosophers and various sects profess to derive their belief from the upanishads.

**Upas Tieute,** in botany, the poison of *Strychnos tieute,* a climbing shrub growing in Java. The natives use it to poison their arrows, its deleterious effects being produced by the presence of strychnine.

**Upas Tree,** the *Antiaris toxicaria,* a large tree growing in Java. Stem naked for the first 60, 70 or 80 feet of its height; leaves alternate, stipulate, entire, unequal-sided, subcordate, costately-veined; flowers in axillary or lateral drooping peduncles, monœcious; males numerous, enclosed in a hairy involucre, calyx with three or four divisions, anthers sessile, three or four; females solitary, calyx in several divisions with a long bipartite style, and ultimately bearing a succulent, drupaceous fruit. The inspissated juice of the upas tree constitutes a virulent poison called by the natives antjar, which owes its deleterious character to the presence of strychnine. The smallest wound by an arrow tipped with this poison is fatal. Toward the close of the 18th century a Dutch surgeon, Foersch, circulated in Europe various myths with regard to the upas tree. It was said to be so deadly that the poison was collected by criminals condemned to death, who obtained their pardon if they brought away the poison which was, however, found fatal to 18 out of every 20 who made the attempt. It was destructive to all vegetable life but its own, and grew in the midst of a desert which it had made. It is now known that the upas tree was credited with the destruction of animal life really attributable to the escape of carbon dioxide from a vent or vents in a valley sur-

rounded by volcanoes. It has been seen growing with other trees in forests, and in 1844 was introduced into foreign hothouses with no deleterious effect.

**Upchurch, John Jorden,** an American mechanic; born in Franklin co., N. C., March 26, 1822; received a common school education. He then engaged in the hotel business in 1841, but as he refused to sell intoxicants was soon forced to close out. He next was employed for 13 years as master mechanic on the Main Hill and Schuylkill Haven railroad. In 1868 he entered the machine shops of the Atlantic and Great Western railroad in Meadville, Pa. While there he organized the Ancient Order of United Workmen and drew up its first ritual. The lodge was formed with 14 members on Oct. 27, 1868. In 1902 it had spread to every State and Territory of the United States and had 420,000 members. In 34 years of its existence it distributed about $112,044,000 in benefits. This organization is based on a plan for the disbursement of money that proved so original and popular that it practically revolutionized the fraternal life-insurance business. "Father" Upchurch, as he was called later, settled in Steelville, Mo., where he died Jan. 18, 1887.

**Upcott, William,** an English historian; born in Oxfordshire, England, in June, 1779; spent a term of years as an apprentice to a London bookseller; and later became a purchasing agent for several large book collectors. In 1806 he became sublibrarian of the London Institution in Old Jewry. He made the largest collection of autographs known up to his time. These include over 36,000 letters. His publications include: "A Bibliographical Account of the Principal Works relating to English Topography" (3 vols. 1818); a large part of a "Biographical Dictionary of Living Authors of Great Britain and Ireland" (1816); etc. He died in Islington, England, Sept. 23, 1845.

**Upfold, George,** an American clergyman; born in Sheneley Green, England, May 7, 1796; settled in the United States in 1804; and was graduated at Union College in 1814 and at the College of Physicians and Surgeons, New York city, in 1816. In the following year he began the study of theology and was ordained in the Protestant Episcopal Church in July, 1820; was rector of St. Luke's Church, New York, in 1822–1830; became rector of Trinity Church, Pittsburg, in 1831. He was consecrated first bishop of Indiana in December, 1849. His publications include: "The Last Hundred Years" (a lecture, 1845); "Manual of Devotions for Domestic and Private Use" (1863); etc. He died in Indianapolis, Ind., Aug. 26, 1872.



**Upham, Charles Wentworth,** an American author; born in St. John, New Brunswick, May 4, 1802; was graduated at Harvard College in 1821, and at its Divinity School in 1824; left the ministry on account of bronchial trouble in 1844; was president of the Massachusetts Senate in 1857–1858; and member of Congress in 1853–1855. His publications include: "Lectures on Witchcraft, comprising a History of the Salem Delusion, 1692"; "Life of John C. Frémont"; Memoir of Francis Peabody"; "Salem Witchcraft and Cotton Mather, a Reply"; "Life of Sir Henry Vane"; etc. He died in Salem, Mass., June 14, 1875.

**Upham, Grace Le Baron,** an American author; born in Lowell, Mass., June 22, 1845; was educated in Boston, Mass. In February, 1870, she married Henry Macy Upham. She became identified with the Daughters of the American Revolution, the Daughters of 1812, the Huguenot's Society of America, the Society of the Mayflower Descendants, the Boston Authors' Society, etc. Her publications include: "Little Miss Faith" (1894); "Little Daughter" (1895); "The Rosebud Club" (1896); "Queer Janet" (1897); "The Ban of the Golden Rod" (1897); "Twixt You and Me" (1898); and "Told Under the Cherry Trees" (1899); etc.

**Upham, Thomas Cogswell,** an American clergyman; born in Deerfield, N. H., Jan. 30, 1799. Among his works are: "Outlines of Imperfect and Disordered Mental Action" (1840); "Life of Madame Guyon," etc. (1847); "Life of Faith" (1848); "American Cottage Life," a series of poems (1850); "Letters from Europe, Egypt, and Palestine" (1855); "Life of Catherine Adorna" (1856); and "Christ in the Soul" (1872). He died in New York city, April 2, 1872.

**Upham, Samuel Foster,** an American clergyman; born in Duxbury, Mass., May 19, 1834; was graduated at Wesleyan University in 1856; entered the ministry the same year; spent 25 years in the pastorate in the leading charges of New England; received the degree of D. D. in 1872, and LL. D. in 1889; and was elected Professor of Practical Theology in Drew Theological Seminary in 1880. Died Oct. 5, 1904.

**Upham, Warren,** an American geologist; born in Amherst, N. H., March 8, 1850; was graduated at Dartmouth College in 1871; served on the geological survey of Minnesota in 1879–1885, and on the United States Geological Survey in 1885–1895. He then became secretary and librarian of the Minnesota Historical Society in St. Paul. His publications include: "The Glacial Lake Agassiz"; "Greenland Icefields and Life in the North

Atlantic, with a New Discussion of the Causes of the Ice Age" (with Prof. G. F. Wright); etc.

**Upharsin.** See MENE.

**Upheaval and Subsidence,** terms applied to movements of the earth's crust that result in more or less permanent changes of level. Such movements are believed to be due to the sinking in of the crust on the cooling and contracting nucleus. The crust under such conditions is necessarily subjected to great crush and strain, from which it gets relief, it is thought by wrinkling — the wrinkles running in linear directions — or by bulging up over much broader areas. Hence two kinds of movement are recognized — (*a*) linear or axial, to which mountains of elevation owe their origin, and (*b*) regional, affecting broad areas, over which the crust seems to rise or, as the case may be, to sink without much disturbance or tilting of strata, though these may often be more or less fractured and dislocated. Such earth movements are believed to take place very slowly and gradually as a rule. These are the generally received views; but of late years doubt has been expressed as to whether regional elevation of the crust is possible. The only movements of elevation of which we have obvious evidence are those that give rise to mountain chains. These movements are tangential — the crust is squeezed and puckered up in rapid folds — but a vertical uprise of a continental area seems to Professor Suess and others impossible. Probably many of the supposed evidences of regional elevation really point to sinking of the crust under the great oceanic basins. These basins, there is reason to think, are preëminently subsiding areas, and if this be so the mere withdrawal of the sea from the continental areas must produce an apparent elevation of the land. Some now begin to suspect, however, that changes of sea level may also be due to other causes. Thus, Professor Suess — believing that in equatorial regions the sea is on the whole gaining on the land, while in other latitudes the reverse appears to be the case — points out that this is in harmony with his view of a periodical flux and reflux of the ocean between the equator and the poles. Dr. Schmick also thinks that the apparent elevations and depressions of continental areas are the result of secular movements of the hydrosphere, but the sea according to him attains a high level in each hemisphere alternately — the waters being at present heaped up in the Southern Hemisphere. Others again, as Dr. Hilber, have suggested that sinking of the sea-level may be due in part at least to absorption. This recalls the view of Celsius, who attributed the retreat of the sea from the coasts of Sweden to gradual desiccation.

**Upjohn, Richard,** an American architect; born in Shaftesbury, England, Jan. 22, 1802; was there educated and learned cabinet making. He removed to the United States in 1829 and settled in New Bedford, Mass. In 1833 he went to Boston and aided in making the designs for the city court house. He removed to New York in 1839 to direct the alterations in Trinity Church, but these were abandoned on a proposal being entertained for the erection of a new edifice. He drew the plans for this edifice, which was completed in 1846 and was then considered the handsomest church structure in conception and detail in the United States. He was also the architect of the Church of the Ascension, the Church of the Holy Communion, and others in New York city, and of the Church of the Pilgrims and Grace Church in Brooklyn. His civic architecture was chiefly that of Italian renaissance, while his domestic buildings include numerous varieties of style. He died in Garrison's, N. Y., Aug. 16, 1878.

**Uplift,** in geology. Strata, although generally in horizontal position, when formed, are, in most regions, at the present time, tilted, or inclined, and the inclinations vary from a small angle to verticality, or even beyond verticality. They have been raised into folds, each fold often many inches in sweep, and equal to a mountain ridge in extent. They have been crumpled up into groups of irregular flexures, one fold or flexure succeeding to another, till like a series of wrinkles on the earth's surface. Every mountain region possesses examples of these flexures or uplifts, and most intermediate plains have at least some undulation, in conformity with the system in the mountains. In connection with all this uplifting, there have been fractures on a great scale; and strata thus broken have been displaced or dislocated by a sliding of one side of such a fracture through varying distances from a few feet to a few miles — one side dropped down to this extent, or the other side shoved up. A dislocation or uplift is called fault, when the dislocation of the strata is in the plane of a fracture.

**Upolu,** one of the richest and most beautiful of the islands of the Pacific, belongs to the Samoan group, lying about 60 miles W. of Tutuila. It is 140 miles in circumference, and has 16,000 inhabitants. The island has been a mission station for many years and now, by an agreement between England, Germany, and the United States (1899), belongs to Germany. Many of the inhabitants are Christians. The chief harbor is Apia, a civilized looking place, with many edifices on the European

model. Many of the natives are turning their attention to the cultivation of cotton. on an average about 200 acres annually are under this crop. Coffee is also cultivated. The principal article of export is cocoanut oil. In 1897 the imports amounted to $329,630; exports to $239,195. See SAMOAN ISLANDS.

**Upper Iowa University,** a coeducational institution in Fayette, Ia.; founded in 1857 under the auspices of the Methodist Episcopal Church; has endowment exceeding $250,000; grounds and buildings valued at over $175,000; scientific apparatus, etc., $4,000; volumes in the library, about 14,000; average number of faculty, 25; average student attendance, 450; graduates, over 500; ordinary income, $20,000.

**Upsala,** the historic center of ancient Sweden, the principal and last stronghold of heathenism in that country, and still one of the most important towns in Sweden, stands on a little stream that runs down to Lake Mälar, 41 miles N. by W. of Stockholm. Its existing importance is due to its being the seat of the primate, the only archbishop of the Swedish church, and of the principal university. The cathedral, built of brick in the Gothic style, was founded in 1289, completed in 1435, partly burned down in 1702, and only partly restored since that disaster. It contains the tomb of Linnæus, and those of Gustavus Vasa and some other Swedish kings. The university, founded in 1477, though new buildings were erected in 1877, is attended by 1,500 students, and possesses a library (1620) of 250,000 volumes and 10,000 MSS., an observatory, botanical garden, and various scientific collections. In the older town, around which on the E. and N. new suburbs have been built, there stands the castle of Gustavus Vasa (1548). Pop. (1906) 24,339. About 3 miles N. E. lies Old Upsala, where are three vast tumuli of the ancient legendary kings; and about 4 miles to the S. E. are the Mora stones, on which the old kings used to take the oaths of good governance.

**Upshur, Abel Parker,** an American statesman; born in Northampton co., Va., June 17, 1790; was admitted to the bar in 1810; practised at Richmond, Va., till 1824; became a member of the legislature in 1825; judge of the General Court of Virginia in 1826; delegate to the convention to revise the State constitution in 1829; and after the reorganization of the judicial system under that instrument was again elected judge of the same court. This position he continued to hold till 1841, when he was appointed Secretary of the Navy by President Tyler. Two years later, on the resignation of Daniel Webster, he was appointed Secretary of State. Early in 1844 he was on the United States steamer "Princeton," on the Potomac river, in company with the President and other members of the cabinet, to witness experiments with a large wrought-iron gun which burst, and mortally wounded him together with several others. He died near Washington, D. C., Feb. 28, 1844.

**Upshure, John Henry,** an American naval officer; born in Northampton co., Va., Dec. 5, 1823; was appointed to the navy in 1841; took part in the Mexican War, where he engaged in the capture of Vera Cruz; was graduated at the United States Naval Academy in 1848; joined the Perry expedition to Japan in 1854; and served as flag-lieutenant of the African squadron in 1857–1859. At the outbreak of the Civil War he was assigned to the South Atlantic blockading squadron, where he remained till 1862, when he was detailed to duty with the North Atlantic fleet, in which capacity he took part in the capture of Fort Fisher in January, 1865. He was commissioned commander in 1866, captain in 1872, and commander in 1880; commanded the New York Navy Yard in 1882–1884, and in the latter year was promoted rear-admiral and ordered to the command of the naval forces of the Pacific. He was retired in May, 1885.

**Upson, Anson Judd,** an American educator; born in Philadelphia, Pa., Nov. 7, 1823; was graduated at Hamilton College in 1843; taught there in 1845–1870; preached in the Second Presbyterian Church in Albany, N. Y., in 1870–1880; was Professor of Sacred Rhetoric at the Auburn Theological Seminary at Auburn, N. Y., in 1880–1887; in 1890 became vice chancellor of the University of the State of New York; 1892 chancellor. Died in 1902.

**Upton, Emory,** an American military officer; born in Batavia, N. Y.; Aug. 27, 1839; was graduated at the United States Military Academy in May, 1861, and was commissioned 2d lieutenant in the 4th artillery; and a few days later was promoted 1st lieutenant of the 5th artillery. He participated in the battle of Bull Run and in the Peninsula Campaign early in 1862. In October of that year he was commissioned colonel of the 121st New York Volunteers. He distinguished himself at the battle of Rappahannock Station, Va., in November, 1863, and especially at Spottsylvania, where he was wounded while leading the 12 attacking regiments of his corps. For his gallantry in the latter action he was promoted Brigadier-General of volunteers and brevetted lieutenant-colonel, U. S. A. He later participated in the Shenandoah Campaign, and won distinction at Winchester, Va., for which he was

brevetted Major-General of volunteers. In March, 1865, he was brevetted Major-General, U. S. A., was promoted Lieutenant-Colonel, U. S. A., in July, 1866. He originated a system of military tactics which were adopted by the government in 1867; was superintendent of the United States Military Academy in 1870–1875; and was promoted colonel, U. S. A., in 1880, and was assigned to the 4th artillery in San Francisco, Cal. His publications include: "A New System of Infantry Tactics" (1867); "Tactics for Non-Military Bodies" (1870); "The Armies of Asia and Europe" (1878); and "The Military Policy of the United States." He died in San Francisco, Cal., March 14, 1881.

**Upton, George Putnam,** an American musical critic; born in Roxbury, Mass., Oct. 25, 1834; was graduated at Brown University in 1854; and removed to Chicago in 1855, where he became identified with musical journalism. He published: "Letters of Peregrine Pickle" (1869); "The Great Fire" (1872); "Memories" (translated from Max Müller, 1879); "Woman in Music," an essay (1880); "Lives" of Hayden, Liszt, Wagner, and Beethoven (1883–1884); "The Standard Operas" (1885); "The Standard Oratorios" (1886); "The Standard Cantatas" (1887); "The Standard Symphonies" (1888).

**Upton, Jacob Kendrick,** an American financier; born in Wilmot, N. H., Oct. 9, 1837; was educated at the Literary and Scientific Departments of Columbia University, and in 1866 the degree of LL. B. was conferred on him by its Law School. He became connected with the United States Treasury Department, where he was chief clerk for two years, and was assistant secretary under Secretaries Sherman, Windom, and Folger. In 1895 he was attached to the United States Life-Saving Service. His publications include: "Money in Politics" (1885); "A Coin Catechism" (1895); and "The Finances of the United States" (in "Appleton's Annual Cyclopædia"). He died in 1902.

**Upton, Winslow,** an American astronomer; born in Salem, Mass., Oct. 12, 1853; was graduated at Brown University in 1875; then pursued studies in astronomy at the University of Cincinnati. In 1877–1879 he was an assistant at the Harvard Observatory; served as assistant engineer in the United States Lake Survey in 1879–1880; was computer for the United States Naval Observatory in 1880–1881; and computer and assistant professor in the United States Signal Service in 1881–1883. In the latter year he was made Professor of Astronomy at Brown University, and became dean there in 1899. He was a member of the United States Eclipse Expedition of 1878 and 1883; and served at the Southern Station of Harvard Observatory in Arequipa, Peru, in 1896–1897; he published the "Star Atlas" (1896); etc.

**Upupa,** in ornithology, the sole genus *of Upupidæ*, with bill long, slender, slightly arched, sharp, and much compressed; nostrils basal, oval, partly concealed by feathers; tongue very short and heart-shaped; head with an erectile crest of oblong feathers, set regularly in pairs for the whole length; wings moderately long, very broad, with 10 primaries; tail of 10 feathers, almost square at the end, feet with the tarsi scutellated behind as well as before; three toes before, one behind, outer and middle united as far as first joint; claws but slightly curved. One species, *U. epops*, the common hoopoe, is a summer visitor to the temperate regions of Europe.

**Upupidæ,** a family of semi-terrestrial, insectivorous picarian birds whose nearest affinities are with the hornbills. It contains a single genus, *Upupa*, characteristic of the Ethiopian region, but extending into the S. of Europe and into all the continental divisions of the Oriental region, as well as to Ceylon, and N. to Peking and Mongolia. The wood hoopoes were formerly placed in this family, but not more generally constitute the family *Irrisoridæ*, with the single genus *Irrisor*.

**Urachus,** a fibrous cord connecting the summit of the bladder with the anterior abdominal wall, passing upward between the linea alba and the peritoneum to the umbilicus. In fœtal life the urachus connects the bladder with the allantois.

**Uraconite,** or **Uraconise,** a mineral of undetermined crystalline form, occurring in exceedingly minute scales, or earthy, on uraninite, at Joachimsthal, Bohemia, Color, lemon-yellow, sometimes orange. Composition: Essentially a hydrated sulphate of the sesquioxide of uranium.

**Uræmia,** in pathology, a disease caused by the retention of urea and other noxious substances in the kidneys and bladder, followed by blood poisoning. It is produced by any cause which prevents the periodical excretion of the urine, and is a most dangerous malady. It takes three forms: Stupor, followed by coma, convulsions of an epileptic type, or coma and convulsions combined.

**Ural,** a river of Russia; rises on the E. side of the Urals in the province of Orenburg, and runs mainly S. for 800 miles into the Caspian Sea, being practically the boundary between Europe and Asia. It gives name to a province, Uralsk, which lies mainly E. of the river and N. of the

Caspian, belonging to the Steppe region and to the "Kirghiz provinces" included in Asiatic Russia.

**Uralite,** in mineralogy, an altered form of Augite, where the exterior form of the crystal is preserved, but the cleavage is that of hornblende. The crystals appear to be composed of a number of minute prisms of hornblende. First made known by H. Rose, as occurring in a green porphyritic rock in the Urals, but it has since been found to be very abundant in many rocks.

**Ural Mountains,** the longest chain of mountains running N. and S. in the Old World, extending for 1,970 miles from the deep basin of the Caspian and Aral seas in lat. 48° W. to the coast of the Northern Ocean, and across the Kara Strait into Novaia Zemlia, terminating at lat. 76½° N. They divide themselves into three sections: (1) The Northern Urals, from the Northern Ocean to the source of the Petchora, consisting of wild and rocky mountains, mostly without vegetation, rising in the highest point, Mount Syrty, to 4,157 feet. Though only 50 miles in breadth, several parallel chains are formed separated by long valleys crossed transversely by depressions which form easy passes for the transport of the produce of Siberia to Archangel. (2) The Middle Urals, extending S. to the source of the Ufa, a broad table-land rather than a mountain chain, of moderate height, sloping gradually W. and E. The highest points are Nurtchum (5,315 feet), Kirtim (4,265 feet), and Kumba (3,330 feet.) The road from Perm to Jekaterinburg is the principal pass. The mineral wealth of the Middle Urals is great, and consists of gold, silver, copper, platinum, iron, and coal. This district yields one-third of the whole iron produce of Russia. (3) The Southern Urals extending S. in three divisions, the extreme W. of which stretches along the right bank of the Ural river. Its highest points are Iremel (5,039 feet), Taganai (3,440 feet), and Vurma (3,448 feet).

**Uralorthite,** a variety of Allanite, occurring in large dull crystals in the Ilmen Mountains, Urals; hardness, 6.0; sp. gr. 3.41–3.647; color, pitch black.

**Uramilic Acid,** $C_8H_{10}N_5O_7$ (?); dialuramic acid; obtained by boiling a solution of dialuramide in sulphuric acid. It crystallizes in transparent four-sided prisms or in silky needles, soluble in water and nitric and sulphuric acids, insoluble in alcohol and ether. With the alkalies it forms crystallizable salts.

**Urania,** in mythology, one of the Muses, daughter of Jupiter and Mnemosyne; she presided over astronomy. She is represented as a virgin, with a crown of stars, draped in garments spangled with stars, holding in her left hand a celestial globe. In astronomy, an asteroid discovered by Hind in 1854.

**Uranic Nitrate,** $(UO_2)''(NO_3)_2{:}6H_2O$; prepared by dissolving pulverized pitchblende in nitric acid, evaporating to dryness, adding water, filtering, and allowing filtrate to crystallize. It is soluble in water and alcohol.

**Uranic Oxide,** $UO_3$; uranyl oxide; a chamois-yellow powder, obtained by heating uranic nitrate in a glass tube to 250°. It dissolves in acids forming the uranic salts.

**Uranic Oxychloride,** $UO_2Cl_2$; uranyl chloride; obtained as an orange-yellow vapor, which solidifies to a yellow crystalline mass, when dry chlorine gas is passed over red-hot uranous oxide. It is soluble in water, and forms double salts with the chlorides of the alkali metals.

**Uraniidæ,** in entomology, pages; a family of *Leepidoptera,* now believed to be hawk moths, but constituting the transition to the tribe of butterflies with which they were formerly placed. They are large, have long slender antennæ, and fly by day. Found in the hotter parts of the world. American species are brighter in color than those from the East Indies.

**Uranin,** or **Uraninite,** a mineral crystallizing in the isometric or cubic system, mostly, however, occurring massive; hardness, 5.5; sp. gr. 6.4–8; luster, greasy to dull; color, velvet-black, grayish; streak, brownish-black to dark olive-green; opaque; fracture, somewhat conchoidal. Composition: Protoxide of uranium, 32.1; sesquioxide of uranium, 67.9 = 100, which is equivalent to the formula $UO,U_2O_3$. Occurring sparingly in Cornwall, Bohemia, Saxony, and a few other localities.

**Uranite,** a tetragonal mineral occurring in square tables or plates with beveled edges, occasionally in square octahedrons; cleavage, basal, micaceous; hardness, 2–2.5; sp. gr. 3.4–3.6; luster of cleavage faces, pearly, of others, sub-resinous; color and streak, various shades of green; transparent to subtranslucent. Composition: A hydrated phosphate of the sesquioxide of uranium and protoxide of copper. The finest varieties of this mineral have been hitherto found in the mines of Cornwall.

**Uranium,** a metal discovered by Klaproth in 1789, who named it after the planet Uranus, discovered about that time. It occurs in the minerals uranium ochre $UO_3H_2O$; pitch blende, which consists of the black oxide $U_2O_5$, associated with silica, lead and iron; chalcolite, uran-glimmer, or uran-mica, which consists of the phosphate of copper and uranium, $CuO,2UO_3P_2O_5$,

$8H_2O$; and uranite, which is the phosphate of lime and uranium $CaO,2HO_3P_2O_5,8H_2O$. Uranium is a very hard, but moderately malleable metal, sp. gr. 18.33, and resembles nickel or iron in color and luster. The salts of the oxides of uranium are of a green or yellow color; the persalts have been most examined. Ferrocyanide of potassium produces in them a very characteristic rich brown precipitate, not unlike that formed by the persalts of copper. They are also precipitated brown by the infusion of galls. Peroxide of uranium is used to give a green or greenish-yellow color to glass, and a suboxide ($U_2O_5$) is somewhat extensively used in porcelain painting for the production of an intense black.

**Uranochalcite,** a name given to a mineral occurring in small velvety nodules formed of radiating crystal fibers; hardness, 2–2.5; color and streak, grass to apple-green. Composition: Probably sulphuric acid, 21.1; oxide of uranium, 33.5; oxide of copper, 7.0; lime, 9.8; water, 28.5 = 99.9.

**Uranocircite,** an orthorhombic mineral strongly resembling autunite, for which it had been long mistaken; sp. gr. 3.53; color, yellowish-green. Composition: Phosphoric acid, 14.0; sesquioxide of uranium, 56.75; baryta, 15.07; water, 14.18 = 100, thus being an autunite in which baryta replaces the lime. Found in veins in the granite of Saxon Voigtland.

**Uranophane,** an orthorhombic mineral occurring in exceedingly minute crystals on the sides of fissures in granite at Kupferberg, Silesia; hardness, 2.5–3; sp. gr. 2.6–2.8; color, honey-yellow. Composition: Essentially a hydrated silicate of sesquioxide of uranium, alumina, and lime.

**Uranoscopus,** in ichthyology, the stargazer; a genus of *Uranoscopina,* with 11 species from the Indo-Pacific and Atlantic, and one, *U. scaber,* known to the ancients, from the Mediterranean Head large, broad and thick, partially covered with bony plates; mouth-cleft vertical; scales very small; two dorsal fins, ventrals jugular, pectorals branched; villiform teeth in jaws on vomer, and palatine bones; a long filament usually present before and below the tongue; gill cover armed. The eyes, which are very small, can be raised or depressed at will. The species are small, inactive fishes, rarely a foot long, generally lying hidden at the bottom between stones watching for their prey. The filament attached to the bottom of their mouth, and playing in a current of water passing through the mouth, serves to allure small marine animals within their reach.

**Uranoso-uranic Oxide,** $U_3O_8 = UO_2 : 2UO_3$; the chief constituent of pitchblende, obtained artificially by igniting uranous oxide in contact with air. It forms a dark-green, velvety powder; sp. gr. 7.1–7.3, hardly acted upon by dilute acids, but dissolving without alteration in concentrated hydrochloric and sulphuric acids.

**Uranosphærite,** a mineral occurring in semi-globular groups of microscopic crystals, with radiated and concentric structure; hardness, 2–3; sp. gr. 6.36; color, orange-yellow to brick-red; luster, greasy. An analysis of perfectly pure material yielded: Sesquioxide of uranium, 50.88; teroxide of bismuth, 44.34; water, 4.75 = 99.97, which gives the formula $BiO_3 2U_2O_3 + 3HO$. Found at the Weisser Hirsch Mine, Schneeberg, Saxony.

**Uranospinite,** a mineral occurring in scales with rectangular contours; crystallization orthorhombic; hardness, 2–3; sp. gr. 3.45; color, siskin-green. An analysis by Winkler gave: Arsenic acid, 19.37; sesquioxide of uranium, 59.18; lime, 5.47; water, 16.29 = 100.31, which is approximately equivalent to the formula $CaO, U_2O_3AsO_5 + 8HO$. Found at the Weisser Hirsch Mine, Scheeberg, Saxony.

**Uranothallite,** a mineral occurring in aggregates of minute crystals or grains as encrustations on uranium ores; hardness, 2.5–3.0; color, and streak, siskin-green; luster, vitreous, on cleavage faces, pearly. Composition: A hydrated carbonate of uranium and lime. Found at Joachimsthal, Bohemia.

**Uranothorite,** a variety of thorite containing nearly 10 per cent. of sesquioxide of uranium. Found in the Champlain iron region, New York.

**Uranotil,** an orthorhombic mineral occurring in radiating or stellar groups of acicular crystals; sp. gr. 3.95; color, lemon-yellow. The mean of three analyses gave: Silica, 13.78; sesquioxide of uranium, 66.75; alumina and sesquioxide of iron, 0.51; lime, 5.27; phosphoric acid, 0.45; water, 12.67 = 99.43, which resembles the composition of uranophane.

**Uranous Chloride,** $UCl_4$; formed by burning uranium in chlorine gas, or by igniting uraneous oxide in hydrochloric acid gas. It crystallizes in dark-green deliquescent octahedrons, soluble in water with a hissing noise, forming an emerald-green solution. When boiled it gives off hydrochloric acid, and deposits a finely-divided brown powder.

**Uranous Oxide,** $UO_2$; obtained by heating uranoso-uranic oxide in a current of hydrogen. It is a brown crystalline powder, soluble in acids, and forming greenish-colored salts.

**Uranus,** in Greek mythology, the most ancient of all the gods. He married Terra,

or Earth, by whom he had, first, the children called the hundred-handed, Briareus, Cottus, and Gyges; secondly, the Cyclopes, Arges, Steropes, and Brontes; thirdly, the Titanes, Oceanus, Cœus, Saturnus, etc.; and lastly, the Giants. He was dethroned and mutilated by his son Saturnus, and from his blood sprang the Furies, Alecto, Tisiphone, and Megæra.

**Uranus,** in astronomy, one of the superior planets between Saturn and Neptune. It was not known to the ancients. When Sir William Herschel, after the construction of his great reflecting telescope, was systematically examining with it all the stars above a certain magnitude, he, on March 13, 1781, found in the constellation Gemini a star which he recognized as having a disk which the others had not. He took it for a comet, and other contemporary astronomers held the same view. Some months afterward as its motions were traced, the opinion arose that it was a planet, and in January, 1783, La Place laid before the Academy of Science, at Paris, calculations relating to its elliptic orbit which established beyond a doubt that this opinion was correct. The discovery led to the appointment of Herschel as British Astronomer-Royal, and the establishment of the observatory at Slough, in Buckingham co., England. Uranus had been noted down by Flamsteed as a fixed star, in his "Historia Cœlestis Brittanica," published in 1725, and he had measured its place four or five times between 1690 and and 1715. Lemonnier had observed it nine times without identifying it as a planet. Bradley and Tobias Mayer had done so at least once. Its diameter is about 31,700 miles — about four times that of the earth, its bulk about 64 times as great; but being of light material its weight is only 15 times as great. It has been reasoned out from analogy rather than proved by actual observation that it rotates, but the time of this rotation is wholly unknown. Its distance from the sun is about 1,800,000,000 miles, and it travels once around the orbit in about 87 years. It receives only about one three-thousandth part of the light and heat from the sun which fall on the earth. It is attended by at least four satellites — Ariel, Umbriel, Titania, and Oberon. Their orbits all lie in the same plane, and are at right angles to the path of the planet itself — a circumstance not known in the case of any other planet. Called also Georgium Sidus and Herschel. See SOLAR SYSTEM.

**Uraria,** in botany, a genus of *Hedysareæ;* papilionaceous plants with pinnate leaves, having generally three leaflets, purple or yellow flowers, and nearly sessile legumes contracted between the seeds. *U. lagopoides,* an Indian species, is considered by the Hindus to be alternative, tonic, and anticatarrhal, and is an ingredient in some of their medicines. The fruit of *U. picta,* another Indian species, is applied to the sore mouths of children, and the plant itself is deemed an antidote for the bite of a Southern Indian snake (*Echis carinata*).

**Urasterella,** a genus of starfishes, having the ambulacral grooves margined by a row of ambulacral plates only. Found in the Silurian. Called also stenaster.

**Urate of Ammonia,** $C_5H_3(NH_4)N_4O_3$; a salt frequently found in urine, and prepared by adding ammonia to uric acid. It is slightly soluble in water, insoluble in alcohol and ether.

**Urban,** the name of eight popes:

URBAN I., succeeded Calixtus I., in 222, and suffered martyrdom in 230.

POPE URBAN V.

URBAN II. (Odo of Lagny); born in Châtillon Sur-Marne, France, about 1042; succeeded Victor III. in 1088. He caused Guibert, who had been supported as anti-pope under the title of Clement III., to be driven out of Rome; preached the first crusade in 1095, and convoked the councils of Bari, Clermont, and Rome. He died in Rome, July 29, 1099.

URBAN III., (Herbert Crivelli), archbishop of Milan, was successor of Lucius II., and was elected to the papal chair in 1185. He endeavored to send assistance to the Christians in the East, who were being sorely pressed by Saladin; but his death took place before he could effect his object. He died in France, Oct. 20, 1187.

URBAN IV., became Pope in succession to Alexander IV. in 1261. He excommunicated Manifred, King of Naples, and offered the crown to Charles, Count of Provence and Anjou, and brother to Louis IX. of France, which led to the subsequent wars of the

Anjous for the possession of Sicily and Naples. He died in Orvieto, Italy, Oct. 2, 1265.

URBAN V., succeeded Innocent VI. in 1362. He restored the papal seat from Avignon to Rome, founded many churches, and reformed numerous abuses. He died in Avignon, France, Dec. 16, 1370.

URBAN VI. (Bartholomew Prignano), succeeded Gregory XI. in 1378. The cardinals afterward chose Robert of Geneva, who took the name of Clement VII., and took up his residence in Avignon. Thus was originated the famous "Western Schism," which endured for nearly 50 years. He died in Rome, Oct. 15, 1389.

URBAN VII. succeeded Sixtus V. in 1590, but died in less than a fortnight afterward, Sept. 28, 1590.

URBAN VIII. (Maffeo Barberini); born in 1568, ascended the pontifical throne in 1623. He condemned the Jansenists, revised the hymns of the Roman Catholic Church, and was the author of some Latin and Italian poems. He died in Rome, July 29, 1644.

POPE URBAN VIII.

**Urbana,** a city and county-seat of Champaign co., O.; on the Pittsburg, Cincinnati, Chicago, and St. Louis, the Erie, and the Cleveland, Cincinnati, and Chicago railroads; 40 miles W. by N. of Columbus. Here are Urbana University (Swedenborgian), a public library, convent, high school, Children's Home, electric lights, waterworks, National banks, and a number of daily and weekly newspapers. The city has an egg-case factory, broom factories, tannery, woolen mills, railroad car shops, straw-board works, etc. Pop. (1890) 6,510; (1900) 6,808; (1910) 7,739.

**Urbanski Ladislas,** a Polish dramatist; born in Lithuania, in 1796. Among his more noteworthy writings are: "The Sorcerers," a poem (1831); "Paradoxes against Liberty" (1833); "Venice Saved," a tragedy (1834); "Poland, Historical, Poetical and Literary" (1836); "Sketch of the Manners of Country People" (1841); "Russia from the Point of View of European Civilization" (1841). He died in Warsaw in 1857.

**Urbino,** an ancient town of Central Italy; in the province of Pesaro and Urbino; between the Foglia and Metauro rivers, remote from the highways of commerce. It is a town of narrow, tortuous streets, with an archbishop's cathedral and other churches; a magnificent ducal palace (1447; restored, and now housing the fine art institution); a free university, dating from 1564, but now attracting less than 100 students, and the house in which Raphael was born, now the town museum. Cheese, silk, pins, and some majolica ware are manufactured, but not the majolica for which the place was famous for a century and a half after 1475. Urbino, anciently the Urbinum Hortense of Umbria, was a municipium under the Romans and was the seat of a line of independent dukes from 1474 to 1631. On the death then of the last duke, Urban VIII. took possession of the duchy as a vacant fief; and it belonged to the Papal States till 1860, when it became part of the kingdom of Italy.

**Urbs Vetus.** See ORVIETO.

**Urceola,** in botany, a genus of *Plumiereæ*; named from the form of the corolla. Leaves opposite, ovato-oblong; flowers small, greenish, in terminal cymes; calyx five-cleft; corolla pitcher-shaped, hairy, with five erect teeth; stamens five, with sagittate anthers; ovaries two, developing into fruit the size of oranges. *U. elastica* of Roxburgh (=*U. esculenta* of Bentham) is an extensive woody climber in the forests of Tenasserim and Pegu. G. W. Strettell believes that it may be utilized for supplying caoutchouc.

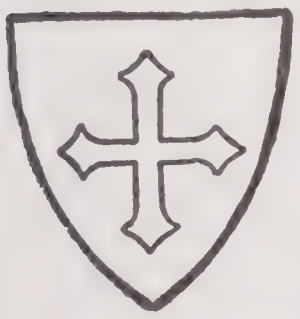
**Urseola,** a pitcher for containing water for ritual use in the Eucharistic service, whether for washing the ministrant's hands or for cleansing the vessels.

**Urceolaria,** in botany, a genus of *Limboridæ,* closely akin to *Lecanora,* and named from the form of the shields. The spermogonia are scattered over the thallus, sometimes on the border of the apothecia. They are inconspicuous on account of their pale color. *U. scruposa* and *U. cinerea* are crustaceous lichens, used in dyeing. The former is the more common, growing on heaths, walls, and rocks. In zoölogy, a genus of *Urceolariidæ,* with a single species, parasitic on *Planaria torva.* Free-swimming, highly elastic, changeable in shape; sucking-disk provided with a simply striated horny ring; the anterior region usually alternate, and with the peristome obliquely set.

**Urceolariidæ,** in zoölogy, a family of peritrichous *Infusoria,* with four genera, from salt and fresh water; all parasitic or commensal; animalcules free-swimming or adherent at will, discoidal, turbinate, or hourglass-shaped; anterior border more or less circular, with a spirally convolute ciliary wreath, the right limb of which descends into the oral aperture; oral system consisting usually of a widened anterior entrance (the vestibulum), and a somewhat prolonged pharyngeal passage; posterior border cup-shaped, adhesive, ciliated, and generally strengthened internally with a horny ring, which in some cases is simple, and in others set with tooth-like processes.

**Urdaneta, Adres,** a Spanish navigator; born in Villafranca, Guipuzcoa, Spain, in 1499. Urged by the council of the Indies, Philip II. decided, in 1558, to undertake the conquest of the Philippine Islands, and appointed Urdaneta chief pilot of the expedition, which left Acapulco Nov. 21, 1564, under Miguel Lopez de Legaspi. The latter took possession of the island of Cebu and conquered Mindoro. Urdaneta returned to Mexico, where he died June 3, 1568.

**Urdée,** or **Urdy,** in heraldry, pointed. A cross-urdée is one in which the extremities are drawn to a sharp point instead of being cut straight.



CROSS URDÉE.

**Urdu,** the Hindustani language, as spoken by the Mohammedan population of India. It is a *lingua franca,* which became the medium of communication between the Mohammedan conquerors of India and their Hindu subjects. It is really the Hindi language, which is of the Aryan family, with a number of Persian, Arabic, and Turkish words introduced into it, though the inflections of nouns and verbs remain unaltered. Many consider Urdu a distinct language from Hindi, but Beames regards this as a great error in philology. It is now the language most largely used by Europeans in their intercourse with the natives of India. It has a literature, chiefly historic, which arose under the Mogul emperors, commencing with Akbar (1556–1605).

**Ure, Andrew,** a Scottish chemist; born in Glasgow, Scotland, May 17, 1778. After lecturing with some success on chemistry, natural philosophy, and materia medica, at Glasgow, he was nominated to the post of astronomer, on an observatory being established in that city. In 1821 he produced a valuable work, entitled a "Dictionary of Chemistry." He took up his residence in the metropolis in 1830, and was four years afterward appointed chemist to the Board of Customs. In 1831 he produced his "Dictionary of Arts, Manufactures, and Mines," a work of immense labor and research, which has gone through many editions, and also has been translated into the leading continental languages. He died in London, Jan. 2, 1857.

**Urea,** one of the few organic bases of animal origin. It forms an essential constituent of the urine of all animals, and is most abundant in that of the mammalia, particularly so in the case of the carnivora. It is the principal outlet of nitrogen from the system, after the materials which compose the animal tissues have experienced oxidation under the influence of inspired air. A person in good health secretes about an ounce of urea daily. Dumas made several fruitless attempts to form urea from the azotized constituents of the body, but Bechamp has recently succeeded in doing so, by subjecting albumen to the oxidizing action of permanganate of potash. Urea does not appear to be formed in the kidneys, these organs appearing to act more as filters in separating it from the mass of blood in which it is formed before it reaches them; perhaps it is produced in the liver. Urea may be formed artificially in several ways, and was one of the first organic products made from inorganic materials. The easiest method of procuring it is by heating together 56 parts of ferrocyanide of potassium with 28 of black oxide of manganese, and washing the residue obtained. The cyanate of potash thus formed is transformed into the ammonia salt by dissolving it in 41 parts of sulphate of ammonia. The cyanate of ammonia may be dissolved out by alcohol, and slow evaporation converts it into urea. It crystallizes in white, slender, straited prisms, which are slightly deliquescent. Its solution has a cool, bitterish taste, and is neutral to test paper. It is very soluble in water and hot alcohol, but sparingly so in ether. It does not appear to form a definite hydrate. It melts at about 248° F., and at a temperature a little above this, it is decomposed into ammonia, carbonate of ammonia, and metameric acid. A solution of urea, heated in a sealed tube, takes up four equivalents of water, and is converted into carbonate of ammonia. The same change takes place in stale urine; hence its ammoniacal odor after keeping it a few days. Though forming salts with certain of the acids, urea does not possess well-marked basic properties. With nitric and oxalic acids it forms crystallizable salts. With certain metallic oxides and salts, such as the oxides and nitrates of silver and mercury, it forms definite crystalline compounds. Urea constitutes about one and a half per cent. of the urine of a

healthy person, or about one-third of its solid constituents. The hydrogen in urea may be replaced by compound radicles, such as ethyl, phenyl, etc., giving rise to numerous compounds, known as the compound urea. It also combines with other radicles, forming ureides.

**Uredinei,** in botany, a section of *Pucciniæi.* Protospores not septate, and disposed in regular sori, or the species have two kinds of fruit. Some alleged species are undoubtedly only the secondary state of other Fungals, but there are Uredinei which appear genuine. All were formerly included under Uredo.

**Uredo,** a genus of minute parasitic fungi, the species of which are parasitic on plants. The diseases called smut, brand, burnt ear, rust, etc., are caused by their ravages.

**Ureide,** compounds containing the elements of a urea salt, minus water; thus alloxan is a monuride of mesoxalic acid, being a compound of that acid with one atom of urea minus $2H_2O$.

**Urena,** in botany, the typical genus of *Ureneæ.* Involucre and calyx five-cleft; style divided above into 10 portions; carpels, five, prickly at the top. *U. lobata,* a shrub commonly occurring with the mango and bamboo in Bengal and throughout India, and *U. sinuata,* a small Indian shrub, have strong fibers, probably well adapted for the manufacture of sacking and twine. In Brazil a decoction of the root and stem of *U. lobata* is employed as a remedy in windy colic, and the flowers are given as an expectorant in dry and inveterate cough.

**Uret,** a name that has been applied to the group $CH_2NO$, which by substitution for one atom of hydrogen in ammonia, may be supposed to form urea, $\left.\begin{matrix}CH_2NO\\H_2\end{matrix}\right\}N$, and by substitution for two atoms of hydrogen, biuret, $\left.\begin{matrix}(CH_2NO)_2\\H\end{matrix}\right\}N$. This term was formerly used as an affix indicative of combination; thus sulphuret now sulphide; phosphuret, phosphide, etc.

**Ureters,** the two tubes which conduct the urine from the kidneys into the bladder, one entering at each side near the base. They are from 14 to 16 inches long, and about the width of a goose quill.

**Urethra,** in anatomy, a membranous tube running from the bladder first directly downward and then forward beneath the arch of the pubes. It is the excretory passage for the urine, serving also in the male for the ejaculation of the semen.

**Urfah.** See Edessa.

**Urfé, Honoré d',** a French romance-writer; born in Marseilles, France, Feb. 11, 1568. He is celebrated for his immensely popular bucolic and allegorical romance "Astrée" (1st part, 1610). It introduces us to a sort of ideal world, in which elegant ladies and gentlemen appear clad as shepherds and shepherdesses, and make pretty observations on topics of the period. He left it unfinished, and the conclusion was supplied by his secretary. He died in Villefranche, France, June 1, 1625.

**Urga,** a town of Mongolia; on the Tola river; in a valley in the great Asiatic plateau; 180 miles S. E. of Kiachta, on the trade route to Peking. It is the religious center for Northern Mongolia, has considerable trade, and a population (partly living in tents outside the city proper) of about 30,000, of whom 6,000 are Chinese. In and about the town, which is the seat of the Bogdan or chief Lama of the Mongols, there were in 1895 about 14,000 Mongolian Lamas.

**Urginea** (named by Steinheil, in 1834, after Ben Urgin, a tribe of Arabs near Bona, Algeria, in whose territory he first collected a species of the genus), in botany, a genus of *Scilleæ,* akin to *Scilla,* but with a more spreading perianth and more numerous seeds. *U. maritima* (*U. Scilla* or *Scilla maritima*) is the squill. *U. indica,* found on the sandy shores of India, is sometimes given as a substitute for the officinal squill, to which, however, it is much inferior in value. It is chiefly used, according to Dr. Ainslie, for horses in cases of strangury and fever.

**Uri,** one of the "Forest Cantons" of Switzerland; forms part of the hill country which surrounds the Lake of Lucerne; area, 415 square miles; pop. (1905) 20,635; consists of the valley of the Reuss, through which runs the great road, and also the railway, into Italy by the St. Gothard Pass. Uri is almost entirely pastoral; and the constitution is a pure democracy.

**Uria,** in ornithology, guillemot; a genus of *Alcidæ,* with eight species, from the Arctic and N. temperate zones. Bill of moderate length, strong, straight, pointed, compressed, upper mandible slightly curved near the point, with a small notch in the edge on each side; nostrils lateral, basal, concave, pierced longitudinally, partly closed by a membrane, which is itself partly covered with feathers; feet short, placed behind the center of gravity in the body; legs slender; feet with only three toes, all in front and entirely webbed; wings and tail short.

**Uric Acid,** a very important excrementitious product, which occurs in small quantities in human urine, to the extent of rather less than 1 per cent. of the solid matter contained in it. It is met with in much greater abundance in the excrement of birds and reptiles, that of the boa con-

sisting almost entirely of urate of ammonia. Guano also contains large quantities of it, and has been most extensively employed as its source in the now almost extinct manufacture of murexide dyes. When excess of uric acid is secreted in the system, it deposits hard crystallizing grains in the bladder, which, if retained, gradually form concretionary calculi, and grow into the disease known as gravel or stones. In gouty patients, uric acid accumulates around the joints, forming white friable concretions, known improperly as chalk-stones. Uric acid is generally prepared by dissolving the dried excrement of the boa in water, and converting the urate of ammonia into nitrate of potash by adding excess of potash, and boiling till the whole of the ammonia has been set free. Hydrochloric acid is then added, and the acid separates in minute crystals, which are thoroughly washed and dried. Pure uric acid is a white crystalline powder, requiring 10,000 parts of water for solution, to which it imparts a very feeble acid reaction. It is insoluble in alcohol and ether, but dissolves in concentrated sulphuric acid, which deposits it in a hydrated condition or dilution. The urates of the alkalies are much more soluble than the acid itself. Uric acid is dibasic, giving rise to acid and neutral salts. By being submitted to heat, uric acid breaks up into a number of compounds; but the remarkable number of definite and crystallizable substances which it gives rise to, when treated with various oxidizing agents, present the highest physiological interest, inasmuch as the great changes which occur in the animal economy under the influence of vitality are always accompanied by oxidation.

**Urim,** in Hebrew antiquities, literally, lights; but the Septuagint translators make it apparently a plural of excellence, in which case it would signify light. Used specially in the compound term Urim and Thummim, believed to mean light and perfection. Many conjectures have been hazarded as to their nature, but the subject still remains very obscure. They were to be put "on the breastplate of judgment," and on or over the heart of the high priest when he specially entered into the presence of Jehovah (Exod. xxviii: 30; Lev. viii: 8). On the return from the Captivity the Tirshatha (governor) forbade certain sacerdotal pretenders, or perhaps the whole body of Aaron's descendants (for the words seem ambiguous), to eat of the most holy things till there should stand up "a priest with Urim and with Thummim" (Ezra ii: 63; Neh. vii: 65). In one place the order of the two words is reversed (Deut. xxxiii: 8). If by Urim in two other passages is meant Urim and Thummim, then they seem to have constituted an oracle to or by which applications might be made to Jehovah for counsel (Numb. xxvii: 21; I Sam. xxviii: 6).

**Urinæ,** in zoölogy, the guillemots, a subfamily or group of sea birds, family *Alcidæ*. Their bill is firm, strong, and pointed; the upper mandible slightly blending near the end, and the base covered with soft, short feathers; tongue long, slender; legs placed far backward; and no hind toe. The black guillemot, *U. grylle* of the North Atlantic, is 13 inches long, and the wing 6½ inches.

**Urinary Bladder,** in anatomy, a hollow membranous and muscular receptacle receiving the urine poured into it through the ureter, retaining it for a longer or shorter period, and finally expelling it through the urethra. In the male it is situated in front of the rectum; in the female it is separated from the rectum by the uterus and the vagina. When completely distended with urine, it rises above the brim of the pelvis and becomes egg-shaped, the larger end constituting its base, or inferior fundus, and being directed toward the rectum in the male and the vagina in the female, and its smaller end, or summit, resting against the wall of the abdomen. In front of the base is the cervix or neck connecting the bladder below with the urethra.

**Urinary Fistula,** in pathology, an abnormal communication between the urinary passages and the external surface, through which the urine finds an outlet in greater or less quantities.

**Urinary Organs,** a collective term, including: (1) the kidneys which secrete urine; (2) the ureters which convey it to (3) the bladder; and (4) the urethra, by which it is evacuated from the body.

**Urinary Vesicle,** in anatomy, a term sometimes applied to the allantois, because from a dilation on its pedicle the mammalian bladder is produced.

**Urine,** the secretion of the kidneys, the chief fluid excretion of man and of the higher animals. Healthy human urine is a transparent light amber-colored liquid, having a saline taste, a peculiar aromatic odor, an acid reaction, and a density varying from 1.010 to 1.025. Its chief constituents are urea, uric, lactic, and hippuric acids, and creatine, together with calcium and magnesium sulphates, chlorides and phosphates, alkaline salts, certain imperfectly known principles, and a coloring substance. The urine contains the liquid portion of useless and noxious residuum left after the assimilation of whatever is useful to the structure.

Morbid states of the urine occur — the aqueous, the subaqueous, the lithic, the phosphatic, the purpuric, the albuminous, and the saccharine. Aqueous urine, with a diminution in its solid contents, is passed in large quantity by nervous and hysteric persons, especially when they approach old age. Subaqueous urine, in some respects the opposite of the first, carries off an unduly large proportion of solid matters, and exists chiefly in decline of the bodily powers, which it tends to accelerate. Lithic urine deposits a pink or purple sand or "gravel," consisting of lithia; its ultimate tendency is to produce lithic calculi. Phosphatic urine contains an excess of phosphatic salts, and deposits a white earthy or chalky powder. Purpuric urine deposits a lateritious sediment. Albuminous urine deposits albumen; sometimes it is an unimportant, but at others a very formidable disease. Saccharine urine is an attendant on diabetes. The mechanism by which the urine is secreted is apparently of a double kind: (1) uriniferous tubules, which seem to be actively secreting structures, and (2) the Malpighian capsules, which appear to act rather as a filtering apparatus.

**Uriniferous Tubes,** small tubes or ducts opening on the surface of the several papillæ into the interior of the calices of the kidneys.

**Urinometer,** an instrument for ascertaining the specific gravity of urine. It is constructed on the principle of the hydrometer, and variations in the density of urine as detected by it are of great importance in the treatment of disease.

**Urlichs, Ludwig von,** a German archæologist; born in Osnabrück, Germany, Nov. 9, 1813. He was Professor of Classical Philology and of Æsthetics at Würzburg. His chief works are: "Charlotte von Schiller and Her Friends" (3 vols. 1860–1865): "Contributions to a History of Art" (1885); "Elements and History of Classical Archæology" (1886. He died in Würzburg, Nov. 3, 1889.

**Urmy, Clarence,** an American musician; born in San Francisco, July 10, 1858; was educated at public schools and at Napa College. He early turned his attention to literature and music; contributed to Harper's, Munsey's, Lippincott's, and the Century magazines; became choir master and organist. His songs and verses are mostly on California topics. He was the author of "A Rosary of Rhyme" (1884); and "A Vintage of Verse" (1887).

**Urn,** any vase; but specially a cinerary urn, the vase, of clay, glass, or sculptured marble, in which peoples who practised cremation preserved the ashes of their dead. The forms and patterns in use among the prehistoric Northern nations differed widely from those found in Roman tombs; nor did any one type prevail even in Rome.

**Urn Burial,** in anthropology, an expression used by Sir Thomas Browne as a subtitle to his "Hydriotaphia," and employed to denote: (1) the deposition of human ashes in a cinerary urn after cremation; (2) less commonly, actual interment of a corpse in an urn. Both methods were practised by the ancient Greeks, and afterward spread W. The Grecian *pithos,* which resembled in size and shape the large oil jars of Southern Europe, was used as an urn to contain burnt human ashes; and two such jars placed mouth to mouth sometimes served as a rude coffin, and thus arranged they are not unfrequently found in the tombs of the Troad. See CREMATION.

**Urnula,** in zoölogy, a genus of *Tentaculifera Suctoria;* animalcules bearing a single retractile, simple or sparsely-branched, filiform tentaculate appendage; excreting and inhabiting a membranous lorica. They multiply by the production of free-swimming ciliated embryos, and by the sub-division of the entire body mass into sporular elements. There is but one species, *U. epistylidis,* which lives attached to the branching pedicle of *Epistylis plicatilis.*

**Urocentrum,** in zoölogy, a genus of peritrichous *Infusoria,* family *Gyrocoridæ,* with one species, *U. turbo,* from salt and fresh water. Free-swimming, ovate or pyriform, persistent; body with one or two circular girdles of cilia; a caudal appendage produced from the posterior region, endoplast and contractile vesicle conspicuously developed.

**Uroceridæ,** in entomology, tailed wasps; a family of *Phytophaga.* Antennæ filiform, of uniform thickness, having from 11 to 24 joints, middle lobe of the mesonotum reaching to the scutellum, and separated from it by a transverse line; abdomen elongated, usually nearly cylindrical, of nine segments; ovipositor long; tibiæ with only a single spine at the apex; larvæ like those of beetles, with six thoracic legs, often rudimentary, and generally no prolegs. The species, which are chiefly from Europe and North America, are not numerous. Called also *Siricidæ.*

**Urochordata,** in zoölogy, a name given by some authors to the *Tunicata.* The group is divided into (1) *Perennichordata,* in which the notochord is found in the tail only, and is retained through life; and (2) *Caducichordata,* in which the caudal notochord is present in the larva only or is never developed. The notochord, when present, may be regarded as having a distinct locomotory function.

**Urocordylus,** in palæontology, a genus of *Labyrinthodonts.* Skull triangular, truncated behind, with a rounded snout; teeth small, slightly curved; ventral armor consisting of scutes in a chevron pattern, reversed behind. From various coal measures.

**Urocyon,** a genus of *Canidæ,* with two species: *U. virginianus* (the gray fox) from North America, and *U. littoralis* (the coast fox) from California.

**Urodela,** in zoölogy, a division of amphibians, often called tailed amphibians, from the fact that the larval tail persists in adult life. The skin is naked, and an exoskeleton is rarely present. The body is elongated posteriorly to form a compressed or cylindrical tail; dorsal vertebræ biconcave, or concave behind and convex in front, ribs short and attached to the transverse processes. The radius and ulna in the fore limb, and the tibia, and fibula in the hind limb, do not grow together so as to form a single bone. Most of them have the four limbs well developed, but in some the posterior limbs are wanting. The urodela are divided into two sub-orders, *Salamandrinæ* and *Ichthyoidea.* In palæontology, from the Permian onward.

**Ur of the Chaldees.** See Orfoh.

**Uroglena,** in zoölogy, a genus of *Flagellata-eustomata,* family *Chloromonadidæ.* Animalcules inclosed socially within a subspheroidal matrix; flagella two; endoplasm inclosing two distinct lateral color-bands, and usually one or more eye-like pigment spots. There is one species, *U. volvox,* from pond water, formerly regarded as an imperfect or transitional form of volvox.

**Urogymnus,** in ichthyology, a genus of *Trygonidæ.* Tail long, finless and unarmed with spines; body thickly covered with bony tubercles; teeth flattened. *U. asperrimus,* about four or five feet long, from the Indian Ocean, is the only species. Its skin is used for covering shields and the handles of swords and other weapons, its rough surface affording a firm grip to the hand.

**Uroleptus,** in zoölogy, a genus of *Oxytrichidæ,* with seven species, all from fresh water. Animalcules free-swimming, elongated, highly elastic, but maintaining the same general contour; posterior extremity usually produced in an attenuate tail-like manner; ventral surface with three or four anterior or frontal styles, and usually two lines of setæ.

**Urolophus,** in ichthyology, a genus of *Trygonidæ,* with seven small species from tropical seas. Tail of moderate length, with a distinct rayed terminal fin, armed with a barbed spine; rudimentary dorsal sometimes present.

**Uropeltidæ,** rough-tail snakes, rough-tailed burrowing snakes; a family of innocuous colubriform snakes, with 5 genera and 18 species, strictly confined to Ceylon and the adjacent parts of Southern India. Body cylindrical, head sharp and pointed, tail short and truncated, with a naked terminal plate, which is sometimes replaced by keeled scales; teeth in both jaws. They sometimes burrow to a distance of four feet below the surface.

**Uropoda,** in zoölogy, a genus of *Gamasidæ.* Palpi and rostrum inferior; dorsal shield of a single broad circular or oval piece; legs nearly equal. *U. vegetans* is a small mite, parasitic on beetles, to which these pests attach themselves by a cord believed to consist of their excrement.

**Urosphen,** in ichthyology, a genus of *Fistulariidæ,* from the Eocene of Monte Bolca. The cylindrical body terminates in a large wedge-shaped fin, whence the generic name.

**Urosticte,** in ornithology, a genus of *Trochilidæ,* with two species, from Ecuador. Bill straight and longer than the head; nostrils not covered with plumes; wings pointed; tail slight, forked.

**Urostyla,** in zoölogy, a genus of *Oxytrichidæ,* with four species from fresh water. They have the general character of the family, but the ventral setæ are developed in great abundance.

**Urotrichus,** in zoölogy, a genus of *Mygalidæ,* intermediate between the desmans and the moles, and agreeing with the shrews in having only incisors in the lower jaw. Nose elongated into a snout, with nostrils at tip; tail stout, covered with long hairs. Two or three species, from Japan and North America.

**Uroxanic Acid,** $C_5N_4H_{10}O_6$; a dibasic acid obtained by boiling uric acid with strong potash lye, allowing the solution to remain in contact with the air for several months, and decomposing the resulting salt with hydrochloric or sulphuric acid. It crystallizes in colorless, transparent tetrahedrons, slightly soluble in cold water, insoluble in alcohol. On boiling with water it is decomposed, carbonic anhydride being given off.

**Uroxanic Anhydride,** $C_5N_4H_8O_5$; uroxil, or uroxyl, a yellowish hygroscopic substance obtained by heating uroxanic acid at 130°, till the weight of the residue becomes constant.

**Urpethite** (after the Urpeth colliery, where found), a member of the paraffin group of hydrocarbons; soft, like tallow; sp. gr. 0.885; color, yellowish-brown. An analysis yielded Johnson: Carbon, 85.83; hydrogen, 14.17 = 100. Separated from the ozocerite of the Urpeth colliery by its ready solubility in cold ether.

**Urquhart, David,** a Scotch economist; born in Bracklanwell, Scotland, in 1805; was educated at Oxford University after which he entered the diplomatic service; was secretary of the British embassy at Constantinople in 1835–1836. He was a representative for Stafford in Parliament in 1847–1852. During most of his public career he antagonized the Eastern policy of Lord Palmerston, which he held was subservient to the ambitious wishes of Russia. His publications include "England, France, Russia, and Turkey" (1835); "The Spirit of the East, a Journal of Travels through Roumeli" (2 vols. 1838); "The Progress of Russia in the West, North, and South" (1853); "Letters and Essays on Russian Aggressions" (1853); etc. He died in Naples, May 16, 1877.

**Ursa Major,** in astronomy, the Great Bear, the most conspicuous of the 20 ancient northern constellations, its seven leading stars attracting notice all the more conspicuously that there is a certain absence of visible heavenly bodies in the adjacent parts of the sky. The Semitic conception of the constellation was that it resembled a bier with mourners walking behind, and it has sometimes been called specifically Lazarus' bier, the four stars constituting a four-sided figure being the bier and the other three, Mary, Martha and Mary Magdalene, the mourners. It is much like a plow, and is often called the Plow, the rectangle constituting its body, and the three projecting stars its handle. To other minds it suggests a vehicle, whence it has been called the Car of David, and sometimes Charles' Wain, or Wagon. The four stars standing together are the wheels, and the three behind are the shaft. Another name is the Dipper. But astronomers cling to the old classical conception of a bear, of which the four stars, Alpha, Beta, Gamma, Delta, Ursæ Majoris, are the hind quarter, and the three the tail. The remaining portions of the animal are marked out by sundry small stars of the third and fourth magnitude. The Bear was supposed to require a ward or keeper. The Arabs gave the seven conspicuous stars names, some of which are still in use. They are called Alpha Ursæ Majoris or Dubhe; Beta, Merak; Gamma, Phecda; Delta, Megrez; Epsilon, Alioth; Zeta, Mizar; and Eta, Alcaid, or Benetnasch. The first two are called Pointers, because a line drawn from Beta through Alpha and continued for about five times as far as the distance between them will reach the pole star. Ursa Major is bounded on the N. by Draco and Camelopardalis, on the S. by Leo Minor, on the E. by Canes Venatici, and on the W. by Lynx and Camelopardalis. Of the seven stars six are of the second magnitude, the remaining one (Delta) being at present between the third and fourth magnitude. Mizar (Zeta) is a double star. Powerful telescopes show that the Great Bear is made up of many thousand other stars.

**Ursa Minor,** in astronomy, the Little Bear; one of the 20 ancient northern constellations, bounded by Draco, Camelopardalis, Cassiopeia and Perseus. Its contour is marked out by seven stars. The curvature of the tail is in the contrary direction to that of the Great Bear; and at its tip is a star of the second magnitude, Alpha Ursæ Minoris, called Polaris, or the Pole Star, midway between Cassiopeia and the Great Bear. Next in brightness are Beta Ursæ Minoris, called by the Arabs Kobab, and Gamma Ursæ Minoris. The two are sometimes designated the Guards of the Pole, or simply the Guards. Kobab is of the second, and the other of the third. The remaining stars are smaller.

**Ursidæ,** bears; a family of the Carnivora, group arctoidea, or, in older classifications, plantigrada. Claws, five on each foot, large, strong and curved, non-retractile; tongue smooth; ears small, erect, and rounded; tail short; nose forming a movable truncated snout; cæcum absent. Though ranged with the Carnivora, many of the ursidæ live entirely or partially on vegetable diet, and their teeth are modified accordingly. They are widely distributed, but are entirely absent from the Australian and Ethiopian regions, and only one species, *U.* (or *Tremarctos*) *ornatus,* from the Andes of Peru and Chile. Wallace reckons 15 species, which have been grouped into as many as five genera, (*Ursus, Thalassarctos, Helarctos, Melursus* or *Prochilus,* and *Tremarctos*); Mivart makes two genera (*Ursus* and *Melursus*); and Professor Flower includes *Ailuropus,* an annectant form connecting *Ursus* with *Ailurus.* The family appears first in the Miocene.

**Ursine Dasyure,** the native or Tasmanian devil. In outward appearance it somewhat resembles a small bear with a long tail; the body is about two feet in length; general color, a brownish-black, with a broad white band across the chest, and another over the back close to the tail. They commit great havoc among sheep and poultry, and are a match for an ordinary dog. In confinement they appear to be untamably savage. They are true marsupials, and have the jaw inflected, but in dental characters and in general habits they resemble the Carnivora. Found only in Tasmania.

**Ursins, Anne Marie de la Tremouille, Princess Des,** a celebrated name in Spanish history; born in France about 1643. She was married in 1659, to the Prince de Talleyrand-Chalais, and in 1675 to the Duke de Bracciano, chief of the Orsini family. After the death of the latter, she was attached to the court of Spain, and really gov-

erned the country during the early part of the reign of Philip V. In 1714, however, she was banished the kingdom, and subsequently was housekeeper for the "Old Pretender," Prince James Stuart. She died in 1722.

**Ursinus College,** a coeducational institution in Collegeville, Pa.; founded in 1869 under the auspices of the German Reformed Church; has endowment exceeding $225,000; grounds and buildings valued at over $125,000; scientific apparatus, etc., $15,000; volumes in the library, about 16,000; average number of faculty, 25; average student attendance, 235; ordinary income, $50,000.

**Ursone,** $C_{10}H_{16}O$ (?), a resinous body, obtained by treating the leaves of the red bear berry (*Arctostaphylos uva-ursi*) with ether in a displacement apparatus, and purifying by crystallization from alcohol. It forms slender, colorless needles, having a silky luster, tasteless, inodorous, insoluble in water, soluble in alcohol and ether, melts at 190° to 200°, and solidifies again in the crystalline form on cooling.

**Urson,** in zoölogy, the *Erythizon dorsatum*, a North American species of tree porcupine. When full-grown it is about two feet long, covered with woolly hair mixed with long, coarse, dark-brown hair, with white or yellowish points It is distributed almost universally over the Eastern United States, and N. through Canada till the limit of the trees is reached. Called also the Canadian porcupine.

**Ursula, St.,** the heroine of a very curious legend of the Middle Ages, whose origin may be ascribed to the 12th century, and which runs as follows. Deonatus, King of Britain, had a very beautiful and pious daughter named Ursula. She was sought in marriage by the heathen prince Holofernes. His suit was granted, but under the following conditions — the prince must become Christian, and wait for three years while the bride-elect went with her companions on a pilgrimage to Rome. The suitor was immediately baptized under the name of Ætherius, and Ursula set out with 11 vessels, in each of which there were 1,000 companion virgins. The company crossed the sea and sailed up the Rhine as far as Basel, from thence they proceeded overland to Rome, where they were honorably received by Pope Cyriakus. The pious and gallant pontiff, along with a multitude of dignified ecclesiastics, accompanied his fair guests a great part of the return journey. and according to some accounts even shared in the final destruction that suddenly overtook the band; for as they were about to land at Köln they were set on by a horde of heathen Huns, by whom they were all slaughtered. Ursula was at first reserved as a bride for Etzel, the Hun king, but on her steadfast refusal of the offer she was transfixed by an arrow, and thus she is represented in mediæval art. But the bloody deed was no sooner accomplished than 11,000 celestial warriors appeared, who completely routed the Huns and freed Köln. The citizens buried the unhappy maidens with pious care by the Rhine, held afterward sacred, and there too Clematius, a Greek pilgrim built a church in their honor.

The story excited suspicion even in a credulous age. But confirmations were not wanting. St. Elizabeth, abbess of the cloister Schönau, by Oberwesel, held spiritual communication with St. Verena, one of the murdered virgins, and saw the whole tragedy enacted as in a vision. Moreover, Egbert, brother of the abbess, and inspired by her, wrote down an explanation and defense of the story. In this several awkward inconsistencies were smoothed away. Thus there was no mention by Roman chroniclers of a Pope Cyriakus; but this (explained the narrator) was because the cardinals were angry at his leaving the city, and blotted out all mention of him from the records of the Church. If it was asked how the virgins made such excellent sailors, it was replied that King Deonatus had with prudent foresight concealed a number of mariners in the hold of each vessel, and so on. Later critics have striven to explain the vastness of the number. It has been ingeniously conjectured that the number, at first 11, became 11,000 by reading the letter M. (meaning martyred) as the Roman numeral 1,000. However this may be, it seems probable that some Christian maidens were really murdered by heathen invaders near Köln, and that the story has thus some basis of fact. No one who is familiar with the literature of the Middle Ages will be surprised at the extravagance of the legend.

**Ursulines,** members of one of those religious orders which resulted from the rise in the Roman Church of the evangelical zeal which was so remarkable a reflex effect of the Reformation. Angela or Angelica Merici (1470–1540), a poor maiden of Desenzano, was their founder. She began in that town, and continued afterward in Brescia, the education of poor children. At the grave of Varallo at Milan, a favorite resort of pilgrims, she was inspired with the determination to found a new religious order, and at the celebration of the mass in the St. Afra Church at Brescia, on Nov. 25, 1535, the order, as a free union without binding vows, was solemnly inaugurated, and named in honor of St. Ursula. Its object was the performance of certain church and household devotions, the instruction of young females, and the bodily and spiritual care of the poor and sick. The order was to be immediately under the supervision of a priest and matron, and Angelica was herself chosen as first matron on March 18,

1537, by the 76 members of the society, and as such she watched over the affairs of the order till her death, three years later, when she was succeeded by the Countess Lucrezia of Ladrone. On June 9, 1544, the order received papal sanction from Paul III., and in 1584 it had increased to 600 nuns in 18 establishments. It quickly spread itself from Italy into other lands, and at the beginning of the 18th century had 20 congregations, 350 convents, and from 15,000 to 20,000 nuns. It was not quite the same in all countries, and was never bound together so strictly as other religious orders were. No general assembly or provincial chapters were held, so that each settlement of the Ursulines stood under the power of the bishop of the diocese. One of its latest developments was the congregation of Chavagnes, in La Vendée, founded by Demoiselle Bréchard in 1805, and containing, in 1862, 300 to 400 sisters in about 30 houses.

**Urtica,** in botany, the nettle; the typical genus of *Urticaceæ*; herbs, rarely shrubs, with stinging hairs and a tenacious inner bark. Leaves opposite, with stringing hairs; calyx four-partite; males with four stamens, and the rudiments of an ovary; females with a subsessile, penicillate stigma; fruit an achene; known species 37, from temperate and tropical climates. *U. urentissima,* called in Timor the Daoun Setan (the devil's leaf) is said by the natives to produce effects continuing about a year, or even to cause death. *U.* (=*Laportea*) *crenulata,* an Indian species, is also formidable. *U. stimulans* of Java is less violent. The fibers of *U. tenacissima,* called in Sumatra, caloose, can be manufactured into very tough cordage; those of *U. cannabina* may be similarly employed. The tubers of *U. tuberosa* are eaten raw, boiled, or roasted by the natives of India. *U. simensis,* the sama of Abyssinia, though acrid, is eaten in that country. The leaves and the seeds of *U. membranacea,* an Egyptian plant, are considered emmenagogue and aphrodisiac. Flogging with nettles was formerly practised for arthritis and paralysis. The old *U. heterophylla,* the neilgherry nettle, is now *Girardinia heterophylla.*

**Urticaceæ,** in botany, nettleworts; an order of diclinous exogens, typical of the alliance Urticales. Tree, shrubs, or herbs, never milky. Leaves alternate, usually covered with asperities or stinging hairs; stipules membranous, often deciduous; flowers small, green, unisexual, scattered, clustered, in catkins or in close heads; calyx membranous, persistent — in the males it is four or five-parted, with four or five stamens inserted into its base opposite to its lobes; females with a tubular, four to five-cleft calyx, three to five staminodes, the style simple or wanting, the stigma simple, fringed, the ovary superior, sessile, one-celled, with a single erect ovule; the fruit a simple indehiscent nut surrounded by the calyx. Nettleworts are widely distributed over the world, flourishing both in hot and in cold countries, and often following the footsteps of man. Known genera, 23; species, 300 or more. (Lindley.) Genera, 43; species, 500. (Sir Joseph Hooker.)

**Urticaria.** See NETTLERASH.

**Urubamba,** one of the head streams of the Amazon river.

**Urubu,** in ornithology, the *Cathartes iota* (or *atrata*), from the Southern United States and Central South America. It is often confounded with the turkey buzzard, from which, however, it may be readily distinguished by the absence of the ring of feathers round the throat. General color black; head and naked part of neck bluish-black with warts and a few hair-like feathers. Called also black vulture and zopilote.

**Uruguay,** a republic of South America; bounded on the N. and N. E. by Brazil, E. and S. E. by the Atlantic Ocean, S. by

the Rio de la Plata, and W. by the Uruguay, which last-named rivers separate the state from the Argentine Confederation. Uruguay has an extreme length of 350 miles by a breadth of 320; area, 72,110 square miles; pop. (1908) 1,111,758; is divided into 19 provinces, of which six have been formed since 1880; and the chief towns are, Montevideo (the capital), Maldonado, Colonia, and San José.

*Physical Features.*— The coast to the N. of Cape Santa Maria is low and sandy, but S. and W. of it, and on the estuary of the Plata, it is more bold and indented, presenting some fine bays and harbors. The most important rivers in the interior are the Rio Negro, with its numerous affluents, and the Arapey, Daiman, Yaguaron, and Sebollati. The greater portion of the sur-

face consists of an elevated plateau, penetrated by many fertile valleys along the S. coast line. The surface of this tableland presents a series of extensive plains, traversed by occasional ranges of hills of no great elevation, the whole being almost destitute of trees. The climate is remarkably mild and salubrious. The minerals are copper, potter's earth, umber. The soil is generally rich and fertile. Wheat, maize, barley, rice, pulse, flax, hemp, cotton, and sugar are the products. Fruits are produced in abundance.

*Zoölogy.*— Among the wild animals are the tapir, deer, ounce, monkey, paca, rabbit, and fox; and large packs of wild dogs roam over the plains. There are also many varieties of birds and water fowl. Vast droves of horses and horned cattle run wild on the pampas, the latter furnishing the jerked and salted beef, tallow, hides, horns, and hair, which constitute the great bulk of the exports of the country.

*Products and Commerce.*— The imports of the republic are principally from Great Britain and the United States. In 1899 the imports amounted to $24,000,000; exports to $37,000,000. In 1898 there were 1,080 miles of railroads, and 4,380 miles of telegraph in operation. For the year 1900 the revenue was estimated at $15,977,992; and the expenditure at $15,969,698. The national debt was $106,646,800.

*Government.*— Theoretically, the constitution of Uruguay is liberal and representative, but, like the majority of the South American States, it has degenerated into a mere military despotism, and the president, usually some general, who has achieved success by violence or intrigue, in reality possesses almost absolute power.

*Religion.*— The established religion is Roman Catholic; other forms of worship are, however, tolerated. The inhabitants are chiefly Creoles of Spanish descent, the Indians and negroes being a comparatively small number.

*History.*— The territory forming the present republic of Uruguay was originally settled by a party of Spanish colonists from Buenos Ayres, and its possession caused a subsequent war between Spain and Portugal, during which it was several times occupied by both. Eventually, however, the country remained in the hands of Spain, who annexed it to the viceroyalty of Buenos Ayres, under the name of Banda Oriental. On the outbreak of the war of independence, the state espoused the side of Buenos Ayres against the mother country, but soon separated from that republic. Annexed by Brazil in 1821, a war ensued, 1826–1828, which was terminated by a treaty of peace, effected through the agency of Great Britain in the latter year, by which the N. part of the territory, known as the Seven Missions, was ceded to Brazil, and the S. portion declared an independent state under the style and title of Republica del Uruguay Oriental. Intestine commotions resulted, followed by a war between Uruguay and Buenos Ayres. England and France being called on to interfere, an allied fleet blockaded Montevideo, 1848–1849, and peace was restored in 1851. In 1860 a revolution took place under Flores, who was defeated in 1863, but reinstated by Brazil in 1865, and assassinated in 1868.

**Uruguay,** a river of South America, which rises in Brazil, in the province of Santa Catharina, flows first W., then gradually turns S., and finally enters the estuary of La Plata opposite Buenos Ayres; length, about 800 miles.

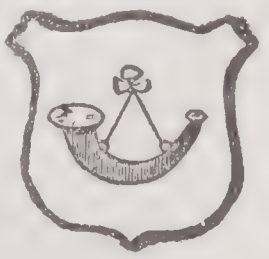
**Urumiah, Oroomiah,** or **Urmiah,** a city of Persia, in the province of Azerbaijan; 64 miles S. W. of Tabreez. It is supposed to be the birthplace of Zoroaster. It is a fortified town and has a population of about 25,000. There is an American mission here.

**Urumiah,** a salt lake in Azerbijan, Persia; 3,900 feet above sea-level; with a length of 90 miles, a breadth of 30 miles, and a circumference of not less than 250 miles. It contains 6 large and about 50 smaller islands, and receives 14 streams, of which the largest are the Jagatu, Tatau, Sefichai, and Ajichai. It has no apparent outlet. The depth for 2 miles does not exceed 3 feet, the average depth is under 12 feet, the greatest depth ascertained 45 feet. The water is so largely impregnated with salt that no fish can live in it, and the banks are covered with a thick saline incrustation, from which a salt of beautiful transparency is obtained for commerce.

**Urumtsi,** the most important city in the Chinese territory of Zungaria, at the N. base of the Tian-Shan Mountains. It is in a fertile district, commands the principal route from Mongolia into Eastern Turkestan, and has a large trade with all the adjoining lands. Pop. about 25,000.

**Urus,** a kind of large ox which ran wild in Gaul at the period of the Roman invasion, as described by Cæsar, perhaps the wild ox such as still exists at Chillingham, in Northumberland and Hamilton in Lanarkshire, or else the aurochs.

**Urva,** in zoölogy, crab mungoos; a subgenus of *Herpestes,* with one species, *U. cancrivora,* from India. It is nearly three feet in length, of which the tail occupies about a third. A narrow stripe of white hair runs from the shoulders, contrasting very decidedly with the grayish-brown tint of the fur; there are some very faintly marked darker bars on the body, and the tail is marked with three or four faint transverse bars; feet and legs of



URVANT.

uniform dark tint. Its habits are aquatic, and it feeds on frogs and crabs.

**Urvant,** or **Urved,** in heraldry, turned or bowed upward.

**Urvoelgyite** (after Urvölgy, the Hungarian name for Herrengrund, where found), a mineral occurring in semi-spherical aggregations of thin hexahedral plates, associated with malachite and other minerals in a conglomerate; hardness, 2.5; sp. gr., 3.132; luster, vitreous to pearly; color, shades of emerald to bluish-green. Composition: A hydrated sulphate of copper and lime, but, as Dana suggests, it "needs further examination on the chemical side." More frequently known under the name of herrengrundite.

**Usagara,** part of the German possessions in East Africa; occupying an extensive area of country inland N. of the Rufiji river. It has mountains of considerable height, and is generally fertile.

**Usambara,** a mountainous territory of German East Africa; about 50 miles N. W. of Zanzibar, extending inland from opposite the island of Pemba. The country grows rice, maize, india-rubber, and tobacco.

**Usbegs.** See TUAREGS.

**Use,** in law, the benefit or profit of lands and tenements that are in the possession of a person who simply holds them for another person, the real beneficiary. He to whose use or benefit the trust is intended, enjoys the profits, and is called *cestui que use.* All modern conveyances are directly or indirectly founded on the doctrine of uses and trusts, which has been deemed the most intricate part of the law regarding property.

**Use and Occupation,** a term in English law denoting the advantage accruing to a tenant from occupying the premises of his landlord. When there has been no lease, or when the terms of the contract of letting are ambiguous, the proper mode to recover rent is by an action for "use and occupation." An action cannot be maintained for the rent of premises let for an illegal purpose; and an immoral purpose is illegal.

**Usedom,** a Prussian island in the Baltic; on the coast of Pomerania; area, 150 square miles. The inhabitants are employed in agriculture and fishing; chief towns, Swinemünde and Usedom. Pop. about 25,000.

**Usener, Hermann Karl,** a German classical philologist; born in Weilburg on the Lahn, Oct. 13, 1834; became professor in the University of Bonn. Among his works are: "Philology and the Science of History" (1882); "Ancient Greek Versification" (1887); "Researches in the History of Religion" (1889); "Names of Gods: An Attempt to Account for Religious Concepts" (1895); etc.

**Ushant,** an island off the W. coast of France; included in the department of Finisterre; area 20 square miles. The coasts are escarped and difficult of access; the soil is fertile. The island has two lighthouses and a telegraph station. Off Ushant two celebrated sea fights took place between the English and the French in 1778, and 1794. The first was indecisive; in the second Lord Howe gained a great victory.

**Ushas,** in Hindu mythology, one of the ancient elemental divinities, the goddess of the dawn. In the Vedic hymns she is represented as a young wife awakening her children and giving them new strength for the toils of the coming day.

**Usher,** an officer who has the care of the door of a court, hall, chamber, or the like. In the royal household of Great Britain there are four gentlemen ushers of the privy chamber. The Gentleman Usher of the Black Rod is an officer of the order of the Garter; the Usher of the Green Rod, an officer of the order of the Thistle. Their service is customary in American churches, at weddings and in places of amusement.

**Usher, Hezekiah,** an American patriot; born in England, about 1615; established himself in Boston in 1646; was agent for the Society for Propogating the Gospel; purchased the press and type for printing Eliot's Indian Bible in 1657; and was one of the founders of the Old South Church in 1669. He died in Boston, Mass., March 14, 1676.

**Usher, Hezekiah,** an American patriot; born in Cambridge, Mass., June 6, 1639; son of the preceding; engaged in business in Boston. During the witchcraft excitement he was arrested, but allowed to escape. He died in Boston, Mass., July 11, 1679.

**Usher, John,** an American colonial executive; born in Boston, Mass., April 27, 1648; son of the first Hezekiah; succeeded his father in business; was colonel of militia; treasurer of Massachusetts; agent in London for the Massachusetts colony for the purchase from Sir Ferdinand Gorges of the title for the district of Maine; and lieutenant-governor of New Hampshire in 1692–1697, and from 1702 till his death, in Medford, Mass., Sept. 1, 1726.

**Usk,** a river of Wales and England which enters the estuary of the Severn 3½ miles S. of Newport, and 18 miles N. W. of Bristol; length, 60 miles.

**Uskup** (ancient, Skopia), a town of European Turkey, in the vilayet of Prisrend; on the Vardar river, and on the Salonika-Mitrovitza railway, 130 miles N. N. W. of Salonika. It is the seat of an archbishop,

and has manufactures of leather, and a pop. of over 20,000.

**Usnea,** a genus of lichens, having a much-branched thallus, with an elastic thread in the center. Some of the species are natives of Great Britain. They grow on trees, and are generally pendulous. They contain the vegetable principle called usnine, which, however, is also found in many lichens. They are sometimes used in dyeing, like archil and cudbear. From their appearance many of the species of usnea receive the popular name of beard moss. See LICHENS.

**Usneidæ,** in botany, a family of *Hymenothalameæ*. Disk from the first open, thallus generally vertical and shrubby, hypothallus none.

**Usnic Acid,** $C_{18}H_{18}O_7$; usnin; found in all members of the genus *Usnea*, and in many other lichens, and obtained from them by treatment with warm lime-water. It crystallizes in yellow leaves or prisms, insoluble in water, slightly soluble in alcohol and ether, and melts at 202°. It dissolves in the alkalies, but the solutions soon take up oxygen from the air, and become brown.

**Uspallata Pass,** a pass over the Andes, between the Argentine Republic and Chile. It was the route taken by San Martin in his invasion of Chile in 1817. The Transandine railroad passes through it. At its highest point it is about 12,800 feet above the sea.

**Ussher, James,** an Irish clergyman, archbishop of Armagh; born in Dublin, Ireland, Jan. 4, 1580. He was the first student of Trinity College, Dublin; ordained 1601. In 1612 he published "The Unbroken Succession of Christian Churches, Especially in the West." In 1615 he was employed to draw up the articles for the Irish Established Church. He corresponded extensively with European scholars, and employed persons to visit the East for the purchase of manuscripts; two of the most valuable obtained were the Samaritan Pentateuch and the Old Testament in Syriac. In 1639 he printed his "Antiquities of the British Churches." His principal other works are: "Tracts on Episcopacy"; "The Power of the Prince and the Obedience of the Subject"; "Annals of the Old and New Testament," containing his famous scheme of Biblical chronology — followed without authority, by the printers of the Authorized Version of the Bible. The volume entitled, "A Body of Divinity" (1654, folio) was compiled without his consent from his sermons and notes. He died March 21, 1655; and he was buried in Westminster Abbey. His library was given to Trinity College, Dublin.

**Ussieux, Louis d',** a French dramatist born in Angoulême, France, in 1747. Among his works are: "History of the Discovery and Conquest of the Indies by the Portuguese" (1770); "The French Heroes; or, The Siege of St.-Jean-de-Losne," a prose drama (1770); "The French Decameron" (1774).. He died in Chartres in 1805.

**Ussing, Ludvig,** a Danish archæologist; born in Copenhagen, April 10, 1820. He wrote: "Greek Travels and Studies" (1857); "Education among the Greeks and Romans" (1863); "Greek and Roman Meter" (1893); "Remarks on Vitruvius's Work on Architecture" (1896); etc.

**Ussuri,** a river of Eastern Asia, a tributary of the Amur; forming for a long distance the boundary between Russian and Chinese territories; length, 300 miles.

**Usteri, Johann Martin** (ös'ter-ē), a Swiss poet; born in Zürich in 1763; excelled in narratives and idyls, written in the dialect of Zürich; among these his "Vicar" holds the foremost place. In High German he wrote: "Enjoy Life" (1793), which became a popular song; and a novel, "Adventures of a Züricher" (1877). He died in Zürich, July 29, 1827.

**Ustica,** an island in the Mediterranean, off the N. coast of Sicily, belonging to Italy. It is 3 miles long and 2 broad. Its soil is volcanic and highly fertile. Its principal town is Santa Maria, with 1,800 inhabitants. There is a penal settlement here and the harbor is defended by strong batteries.

**Ustilaginei,** in botany, a tribe of fungals, order or sub-order *Puccinæi*. The species grow in the interior of the ovaries, anthers, and other organs of flowering plants, producing deformity, absorption of the internal tissue and its replacement by the pulverulent spores of the fungals, constituting a dark-colored and fetid powder. The protospores are produced from very delicate branching tissue, or from closely packed cells.

**Ustilago,** in botany, the typical genus of *Ustilaginei* (Berkeley), a genus of *Cœomacei* (Lindley). The spores are simple, with a simple coat. It contains the various kinds of smut so destructive to corn, to reed beds, etc.

**Usufruct,** in law, the temporary use and enjoyment of lands or tenements, or the right of receiving the fruits and profits of land, or other things, without having the right to alienate or change the property.

**Usury,** an excessive or exorbitant interest or premium paid, or stipulated to be paid, for the loan of money. Also the practice of lending money at interest; the practice of taking interest for money lent; specifically, the practice of taking exorbitant or excessive interest for the loan of money; the practice of exacting interest in an exorbitant way from needy or extravagant borrowers. In the ancient world, interest was always usurious as it is in the

East at the present day. The Mosaic Law prohibited taking interest from Hebrews (Exod. xxii: 25; Levit. xxv: 35–37; Deut. xxiii: 20); and Christ's words, "Give to him that asketh thee" (Matt. v: 42), seem to be of still wider application. The Fathers regarded interest as usury, and therefore as a species of robbery; and this opinion prevailed in the Church till the 16th century, and numbered Luther and Melanchthon among its defenders. Calvin appears to have been the first theologian who propounded the modern distinction between interest and usury.

**Utah,** a State in the Western Division of the North American Union; bounded by Wyoming, Colorado, Arizona, Nevada, and Idaho; admitted to the Union, Jan. 4, 1898; number of counties, 27; capital, Salt Lake City; area, 84,928 square miles; pop. (1890) 207,905; (1900) 276,749; (1910) 373,351.

*Topography.*— The surface of Utah is similar to a basin surrounded by high mountains. The interior has an elevation of 4,000 feet above sea-level, and is crossed in a N. E. and S. W. direction by the Wasatch Mountains with an altitude of 12,000 feet. E. of the Wasatch Mountains are the Uintah, near the Wyoming boundary, and W. are numerous, detached hills, ridges, and isolated mountains. Lofty plateaus occupy the S. E. The principal rivers are the Green and Grand, uniting in the S. E. to form the Colorado. Nearly all the others empty into the Great Salt Lake, or similar salt lakes with no outlets, which occur throughout the W. of the State. The Great Salt Lake is about 80 miles in length and has an average width of 40 miles; its waters are salt, and it has no communication with the ocean. It is connected with Utah Lake by the Jordan river. Sevier Lake, another large body, has no outlet, but receives the North Sevier river. Utah contains part of the great cañon of the Colorado, and the Great American Desert, an extensive sandy and waterless plain W. of the Great Salt Lake.

*Geology and Mineralogy.*— The rocks are most primitive, of Archæan origin, and showing everywhere evidences of volcanic action. Limestone of carboniferous deposit is found in many ridges. Granite, gneiss, jasper, syenite, porphyry, quartz, serpentine, gypsum, marble, calcareous spar, and sandstones occur in large quantities throughout the State. Iron ores, coal, gold, and silver, copper, zinc, salt, asphaltum, and borax form the principal mineral resources. In 1900 the chief mineral productions were coal, 1,233,978 short tons, valued at $1,447,750; gold 206,261 fine ounces, valued at $4,263,414.87; silver 10,196,818 fine ounces, valued at $6,248,610.07; salt, 249,128 barrels, valued at $151,6662; portland cement 70,000 barrels, valued at $175,000; mineral waters, 8,500 gallons, valued at $2,125; granite, valued at $2,170; sandstone, $66,733; limestone, $12,749, and clay products, $216,449.

*Agriculture.*— The soil is as a rule arid and sandy, and in many places so impregnated with salt as to be entirely useless. Much, however, has been reclaimed by irrigation and rendered profitably productive. In the highland portion of the State rainfall is sufficient for cultivation and the mountains and high valleys produce an abundance of fine grass, in consequence of which stock raising and dairy farming have been greatly developed. The principal farm crops in 1900 were corn, 169,180 bushels, valued at $106,583; wheat, 3,697,106 bushels, valued at $2,033,408; oats, 918,214 bushels, valued at $404,014; barley, 217,686 bushels, valued at $119,727; rye, 59,202 bushels, valued at $30,785; potatoes, 649,000 bushels, valued at $311,529; and hay, 509,855 tons, valued at $4,053,347.

*Manufactures.*— There were reported by the United States census in 1900, 1,669 manufacturing establishments, employing $14,650,948 in capital and 7,355 persons; paying $3,395,900 in wages, and $12,942,107 for raw materials, and having finished products valued at $21,299,500. The principal manufactures were beet sugar, railroad cars, flour and grist, packed meat, printing and publishing, woolen goods, bread and other bakery products, foundry and machine shop products, preserved and canned fruits, malt liquors and leather goods. Salt Lake City is the principal manufacturing center with an output of $6,109,409.

*Banking.*—On Oct. 31, 1901, there were reported 10 National banks in operation, having $1,600,000 in capital, $1,304,535 in outstanding circulation, and $1,275,000 in United States bonds. There were also 288 State banks with $2,789,200 in capital, and $5,874,024 in surplus. The exchanges at the United States clearing house at Salt Lake City during the year ending Sept. 30, 1901, amounted to $167,689,433, an increase over those of the preceding year of $45,984,016.

*Education.*— At the end of the school year 1899–1900 the children of school age numbered 89,818; the enrollment in public schools was 73,042; and the average daily attendance, 50,595. There were 705 public school buildings, public school property valued at $2,932,745, and 1,466 teachers. The receipts for the year amounted to $1,211,221.87; and the expenditures, $1,156,502.92. For higher education there were 4 public high schools, 12 private secondary schools, 2 public, and 2 private normal schools, the Brigham Young College at Logan, and the Sheldon Jackson College, Salt Lake College, and University of Utah, at Salt Lake City.

# UTAH

SCALE OF MILES
0 10 20 30 40 50 60

State Capital ★ County Seats ⊙
Military Reservation Boundaries
Indian " "
Forest Reserve " "

114° A 113° B 112° C 111° D 110° E 109°
42° 41° 40°
1 2 3

IDAHO
WYOMING
COLORADO
NEVADA
GREAT SALT LAKE DESERT
GREAT SALT LAKE
UTAH LAKE
BEAR LAKE
Bear R.
Goose Cr.
Raft R.
Grouse Cr.
Cedar Range
Deep Creek Mts.
Dugway Mts.
Dugway Valley
Desert Range
Grass Mountain Pass
Pilot Peak Range
Pilot Pk.
Boundary Cone
Dutch Mt.
Clifton Mts.
Granite Mts.
Camels Back
Thomas Range
Black Rock Ridge
McDowell Mts.
Dolphin I.
Gunnison I.
Stansbury I.
Antelope I.
Fremont I.
Promontory Pt.
Promontory Ra.
Blue Spring Hills
Malad L. S.
Bear R. S.
Boundary Hills
Wasatch Mts.
Uinta Mts.
Bear River B.
Great Salt Lake Desert
Salt Marsh Lagoon
Utah Lake
Provo Bench
Provo Bay
Jordan R.
Weber R.
Provo R.
Strawberry Valley
Strawberry Cr.
Duchesne R.
Green R.
Yampa R.
White R.
Willow Cr.
Sage Cr.
Lincoln or Muddy Cr.
Bear R.
Rhodes Plateau
Du Chesne R.
Lake Fk.
Uinta R.
Ashley R.
Brush Cr.
Diamond Cr.
Split Mt.
Cliff Cr.
Raven Ridge
Bad Lands Cr.
Red Cr.
Willow Cr.
Asphalt Gr.
Evacuation Cr.
Water Cr.
Tepee Cr.
Hill Cr.
Roan or Bookcliffs
Tavaputs
Gray Head
Bad Land Cliffs
Minnie Maud Cr.
Barkhouse Cr.
Burnt Fork
Henry's Fk.
Lucerne
Lonetree
Mountain View
Alfamount
Almy
Evanston
Fort Bridger
Carter
Cumberland
Glencoe
Muddy Cr.
Granger
Baxter
Green River
Black Fork
Sage
Moyer
Cokeville
Montpelier
Paris
North L.
Garden Cy.
Kimball Pk.
Mt. Gog
Mt. Magog
Twin Pk.
Laketown
Meadowville
Randolph
Woodruff
Monte Christo
Bingham's
Baldy
Wyuta
Wasatch
Mt. Corson
Manila
Bridgeport
Mt. Wheeler
Green
Mt. Lena
6 Mile Pk.
Leidy Pk. 12,250
Marsh Pk. 12,250
Burro Pk. 12,634
Gilbert Pk. 13,627
Wilson Pk. 13,300
Emmons Pk.
Mt. Agassiz 13,000
La Motte Pk.
Bald Mt. 12,620
Mt. Heber 10,270
Blacktail Mt.
Provo Pk.
Pt. Carbon
White Rock Agency
Maeser
Vernal
Naples
Jensen
Ft. Duchesne
Randlett
Ouray
Cypress Hills
Cathedra
Butte
Dragon
Old Ft. Thornburg
Soldiers Summit
Colton
Scofield
Hale
Nolan
Castlegate
Mt. Plateau
Bantles
Harper
Indianola
Winter
Hilltop
Burriston
Mona
Starr
Santaquin
York
Clinton
Tucker
Pines
Thistle
Castilla
Saleratus
Boulter Summit
Callao
Fishsprings
Dugway Sta.
Ibapah
Trout Cr.
Round Valley
Deep Creek
Lofgreen
Vernon
Faust
Rush Val.
Ajax
Sunshine
Fairfield
Cedar Fort
Geneva
Vineyard
Sharon
Nunns
Wallsburg
Charleston
Alpine
Diaper
Lehi
Saltair
Black Rock
Garfield Beach
Lakeside
Strongknob
Pilot Pk.
Lucin
Snow Mt.
Montello
Gartney
Umbria
Terrace
Terrace Mts.
Red Dome
Bovine
Matlin
Ombey Mts.
Hog
Peplin
Grouse Creek
Clear Cr. Pk.
Rosette
Park Valley
Elinor
Kelton
Kelton Pk.
Curlew
Curlew Valley
Twin Pk.
Snowville
Hansels Mts.
Monument
Nella
Vipont
Oakley
Conant
Bridge
Raft R.
Goose Cr.
Samaria
Malad City
Stone
West Portage
Garner
Weston
Preston
Franklin
Cornish
Ransom
Washakie
Newton
Cache Jc.
Collinston
Riverside
Fielding
Portage
Lewiston
Cove
Richmond
Smithfield
Hyde Park
King
Logan
Meadowville
Garland
Deweyville
Penrose
Bear R. City
Blue Cr.
Balfour
Corinne
Honeyville
Mendon
Providence
Hyrum
Wellsville
Brigham
Perry
Willard
Bear River B.
Bonneville
Harrisville
N. Ogden
Utah Hot Spgs
Ogden
Riverdale
Roy
Weber R.
Ogden R.
Plain City
Syracuse Jc.
Syracuse
Layton
Kaysville
Lee
Lagoon
Centerville
Porterville
Farmington
Wood Cr.
Bountiful
Parkins
Big Mt.
Stansbury I.
Dunstein
Low Pass
Delle
Hog Back
Arena
Knolls
Clive
Saldura
Wendover
Grantsville
Tooele Sta.
Tooele
Buehl
Stockton
Canon
Bingham Jc.
West Jordan
Hallway
Spur
Roseville
Lakeport
Miller
Murray
Riter
Eldorado
Salt Lake City
Sugarhouse
Granger
Hoytsville
Wanship
Atkinson
Rockport
Peoa
Oakley
Marion
Kamas
Woodland
Park City
Midway
Heber
Charleston
Alpine
Pleasant Grove
American Fk.
Lehi
Mercur
Ophir
Clover
St. John
Reeves
Cedar Fort
Fairfield
5 Mile Pass
Cedar Val.
Del Monte
Utah Lake
Provo City
Springville
Spanish Fork
Payson
Goshen
Eureka
Mt. Nebo
Mill Fork Sta.
Thistle
Saleratus
Lake Bottom
Mill Creek
Echo City
Coalville
Upton
Emory
Castle Rock
Morgan
Strawberry
Peterson
Croydon
Henefer
Lost Cr.
Devils Slide
Little Mt.
Owhyee
Reese
Mud I.
Promontory Pt.
Promontory Ra.
Saline
Colin
Midlake
Rambo
Fremont I.
Carrington
Davis
Lakeside
Strongknob
Alt. above Sea 4210 ft.
Strong's Knob
Jackson
Berino
Lemay
Newfoundland
Groom
Loy
Hogup
Olney
Teck
Pigeon
Lucin
Bovine
Terrace
Umbria
Gartney
Montello
Pilot Peak Range
Pilot Pk.
Desert Range
Grass Mountain Pass
Wendover
Salduro
Arena
Knolls
Clive
Delle
Hog Back
Low Pass
Dunstein
Stansbury I.
Grantsville
Salt Marsh Lagoon
Boundary Cone
Dutch Mt.
Creek Valley
Deep Creek
Deep Creek Mts.
Clifton Mts.
Granite Mts.
Dugway
Dugway Valley
Dugway Mts.
Camels Back
Thomas Range
Black Rock Ridge
McDowell Mts.
Trout Cr.
Round Valley
Ibapah
Callao
Fishsprings
Dugway Sta.
Boulter Summit
Lofgreen
Vernon
Faust
Rush Val.
Ajax
Sunshine
Fairfield
Cedar Fort
Geneva
Vineyard
Sharon
Nunns
Wallsburg
Charleston
Alpine
Diaper
Lehi
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Garfield Beach
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Tooele Sta.
Tooele
Buehl
Stockton
Canon
Bingham Jc.
West Jordan
Hallway
Spur
Roseville
Lakeport
Miller
Murray
Riter
Eldorado
Salt Lake City
Sugarhouse
Granger
Hoytsville
Wanship
Atkinson
Rockport
Peoa
Oakley
Marion
Kamas
Woodland
Park City
Midway
Heber
Charleston
Alpine
Pleasant Grove
American Fk.
Lehi
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Goose Cr.

Hammond's 8 x 11 Map of Utah
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*Churches.*— The strongest denominations in the State are the Church of Jesus Christ of Latter-Day Saints; Roman Catholic; Methodist Episcopal; Protestant Episcopal; Presbyterian, North; and Congregational. In 1899 there were reported 135 Evangelical Sunday-schools, with 800 officers and teachers, and 8,500 scholars.

*Postoffices and Periodicals.*— On Jan. 1, 1901, there were 339 postoffices of all grades; and 73 periodicals, of which 5 were daily, 1 tri-weekly, 6 semi-weekly, 51 weekly, 3 semi-monthly, and 7 monthly.

*Railroads.*—The total length of railroads within the State on Jan. 1, 1901, was 1,582 miles, of which 11 miles were constructed during the previous year.

*Finances.*— On Oct. 1, 1901, the total bonded debt of Utah, was $900,000; divided as follows: Refunding bonds, $450,000; State bonds, $200,000; and territorial bonds, $250,000. The assessed valuation of all taxable property in 1901 was $112,360,593. The State tax rate was $5 per $1,000 and the school tax $3 additional.

*State Government.*— The governor is elected for a term of four years and receives a salary of $4,000 per annum. Legislative sessions are held biennially and are limited in length to 60 days each. The Legislature has 18 members in the Senate, and 45 in the House, each of whom receives $4 per day. There is one Representative in Congress. The State government in 1902 was Republican.

*History.*— The region embracing Utah was acquired from Mexico in 1848, and the Territory was organized in 1850, comprising Utah, Colorado, Wyoming, and Nevada. The Mormons led by Brigham Young settled in Salt Lake valley in 1847, and rapidly occupied the fertile valleys of the Territory, few Gentiles settling there till the extension of railroads made it more easily accessible. At a later period the Gentile population rapidly increased, and vigorously opposed the supremacy of the Mormons, who controlled all government positions. A bill passed by Congress in 1882 disfranchised all polygamists and annulled the act of the Territorial Legislature extending the franchise to women. In 1887 a bill was passed, which confiscated the property of the Mormon Church and the Perpetual Emigration Fund, with the exception of the church buildings and parsonages, and devoted it to the support of public schools in the Territory. The Mormons renounced polygamy in 1890. For a considerable time previously efforts had been made to have Utah admitted into the Union; but this was not acceptable to Congress till after the abolition of polygamy. A bill was passed in December, 1893, making Utah a State. It was not finally consummated, however, till Jan. 4, 1896, when it entered into Statehood as the 45th State of the Union.

**Utah, University of,** a coeducational, non-sectarian institution in Salt Lake City, Ut.; opened in 1850; has productive funds exceeding $400,000; grounds and buildings valued at over $675,000; scientific apparatus, etc., $140,000; volumes in the library, about 30,000; average number of faculty, 65; average students, including summer school, 1,400; graduates, over 1,600.

**Utah Agricultural College,** a coeducational, non-sectarian institution in Logan, Ut.; chartered in 1888; opened in 1890; has productive funds exceeding $200,000; grounds and buildings valued at over $330,000; scientific apparatus, etc., $65,000; volumes in the library, about 17,000; average number of faculty, 60; students, 850; graduates, over 160.

**Utahite,** a mineral occurring in minute micaceous crystals as an incrustation upon a quartzite in the Eureka Hill mines, Juab co., Ut. Crystallization, rhombohedral; luster, silky; color, brownish-yellow. Composition: Sulphuric acid, 28.45; arsenic acid, 3.19; sesquioxide of iron, 58.82; water, 9.35 = 99.81, yielding formula $As_2O_5,3Fe_2O_3, 3SO_3 + 4H_2O$.

**Utah Lake,** a fresh-water lake in the State of Utah; 30 miles S. of Salt Lake City. It is 25 miles in length N. to S., with an extreme width of 13 miles. Its waters are drained into Great Salt Lake by means of the river Jordan. Several Mormon towns are on its E. shores.

**Utahs,** or **Utes,** a tribe of American Indians of the Shoshone family, living on reservations in Utah and California, having sold most of their lands to the United States government. They number about 2,000.

**Utakamand.** See OOTACAMUND.

**Uterus,** in comparative anatomy, a dilation in the walls of the oviduct for the preservation or development of the ova. In birds, although the ova are developed externally, the term uterus is often applied to that cavity where the eggs receive the shell. In most of the viviparous fishes, and in the viviparous lacertilia and ophidia the ova develop within the uterine cavity without any assistance or nourishment from the mother. In the Prototheria (= *Ornithodelphia* = *Monotremata*) the oviducts according to some authorities, have no distinct uterine or Fallopian portion, but open directly into a cloacal chamber. Gegenbaur, however, calls the lower end of each oviduct a uterus. In the Metatheria (= *Didelphia* = *Marsupialia*) each of the oviducts is differentiated into uterine and Fallopian tracts, opening into a long and distinct vagina. In the Eutheria (= *Monodelphia*, including all other mammals) the uterus is variously modified. In the Pri-

mates it is normally single, though instances of a double uterus occasionally occur; it is two-horned in the Ruminantia, Pachydermata, Equidæ, and Cetacea, and is said to be divided when it has only a very short body, which speedily divides externally and internally, and is continuous with the oviducts (as in most of the Carnivora and Edentata, and some of the Rodentia); it is actually double in some of the Edentata and in most of the Rodentia, including the mouse and the hare, each oviduct passing into an intestiniform uterus, which has two completely distinct openings lying near to each other within the vagina.

In human anatomy, a hollow, muscular organ, with very thick walls, situated in the pelvic cavity, between the rectum and the bladder. The virgin uterus is about three inches long, two broad, and one inch thick at its upper extremity. The middle part is called the body, the upper the fundus, and the lower, opening into the vagina. the neck. Its chief function is to receive the ovum from the Fallopian tubes, and to retain and support it during the development of the fœtus, which it expels by muscular contractions at parturition. During uterogestation the uterus becomes greatly enlarged and undergoes important structural changes; the uterus is liable to many affections and diseases, as tumors, ulceration, catarrh, tenesmus, hemorrhage, etc.

**Utica,** a city and county-seat of Oneida co., N. Y.; on the Mohawk river, the Erie canal, and the West Shore, the Lackawanna, the New York, Ontario and Western, the New York Central and Hudson River, the Unadilla Valley, and the Rome, Watertown and Ogdensburg railroads; 52 miles E. of Syracuse. It is built on a slope of ground rising from the river, and is about 500 feet above sea-level.

*Business Interests.*— The city is the center of a large dairying district, and is the principal cheese market of Central New York. The chief manufactures include heating apparatus, steam fittings, cigars, grist and flour mill products, machinery, hosiery and knit goods, cotton and woolen goods, men's clothing, iron pipe, furniture, agricultural implements varnish, oil cloth, trunks, etc. There are four National banks with a combined capital of $1,900,000. The city contains many daily, weekly and monthly periodicals. The assessed property valuations exceed $38,500,000, and the total debt is about $200,000.

*Public Interest.*— Utica has an area of 10 square miles; waterworks with 86 miles of mains; and a sewer system covering 77⅓ miles. There are in all 107 miles of streets of which 42 miles are paved. The city is lighted by electricity at a cost of about $70,000 per annum; the police department costs annually about $40,000, and the fire department about $65,500. There are over 9,000 pupils enrolled in the public schools, and the annual expenditures for public education exceed $178,000. The maintenance of the city government costs about $572,000 per annum. Utica is known as the "City of Charities" because of its numerous charitable institutions, which include a Masonic Home, St. Luke's Homœopathic, and Faxton Hospitals, Home for the Homeless, Home for the Aged, St. Vincent's Protectory, Utica Orphan Asylum, the largest insane asylum in New York State, etc. Here are also a United States government building, public library, Academy of the Assumption, Young Ladies' Seminary, business colleges, School of Music and Conservatory of Music.

*History.*— During the Revolutionary period it was a frontier trading post, and the site of Fort Schuyler. It is a part of the original tract of 22,000 acres which the king granted to William Crosby, the colonial governor in 1734. Utica was settled by colonists from England and New England. It was incorporated as a village in 1798, and received its city charter in 1832. Pop. (1900) 56,383; (1910) 74,419.

**Utica,** an ancient city of North Africa; 20 miles N. W. of Carthage; originally founded as a Phœnician colony in 1101 B. C. Its ruins include an amphitheater, an aqueduct, and the remains of quays; for a bay then carried the sea (now nearly 10 miles distant) to the site. During the third Punic war Utica submitted to Rome, and became the capital of the province of Africa. Afterward it was the see of a bishop, till its destruction by the Arabs.

**Utilitarianism,** that theory of life which represents happiness as the only ultimate end to be devised and sought after — not necessarily the happiness of the individual, but that of the human race as a totality, and "even as far as possible of the sentinent creation"— in Bentham's phrase "the greatest happiness of the greatest number." The theory as one of moral action asserts — "Actions are right in proportion as they tend to promote happiness, wrong as they tend to produce the reverse of happiness" (Mill's "Utilitarianism"). Like all other systems, Utilitarianism is best looked at from the point of view of its historical development. We find its first statement as a philosophical theory among the Greeks. It is presupposed in the philosophy of Socrates, or rather it unconsciously underlies that philosophy; but to claim Socrates as an adherent of utilitarianism is to apply modern conceptions to ancient ideas and the result is only misleading. The same remark applies to Aristotle, who asserted that the absolute end (*telos*) of human action is happiness; since the statement is almost meaningless, unless

taken in accordance with the whole teaching of his philosophy. In Epicurus we recognize a true adherent of Utilitarianism. He "sought the *summum bonum* in felicity of life"; not, indeed, in any low sense, since he held that pleasure was a certain fair even satisfaction and calm, extending over the whole life, and did not consist of moments of ecstatic joy. Still, all happiness is thus reduced to a strictly individual system, and the gaps in this as well as in the opposite (Stoic) system are strikingly represented in the paradox, common to both, of the wise man happy on the rack. Thus Utilitarianism as far as it was capable of development as an individual system, received that development in Greece. For its further development we must refer to the last 300 years of English thought.

Hobbes enunciated with startling plainness a system of individual selfishness. "Whatsoever is the object of any man's appetite or desire, that is it which he for his part calleth good, and the object of his hate and aversion evil; and of his contempt rude and inconsiderable." Each man, continues Hobbes, must settle for himself what is right and wrong according to his individual pleasure; or if there be a collision of interests, he must concur in the appointment of some arbiter (the State) who shall settle what is right and wrong for him. With Paley Utilitarianism took a theological aspect. Virtue he defined to be "the doing good to mankind, in obedience to the will of God, and for the sake of everlasting happiness." This particular development of Utilitarianism is deserving of more attention than it usually receives. Paley only consciously stated what the great majority of his countrymen unconsciously believed, for this practical definite form is exactly in accordance with the English mind. As a proof of this it may be noted that men so widely removed from Paley and from each other as Berkeley and Butler, assume without a doubt a moral system analogous to this.

With Jeremy Bentham the inventor of the term the "greatest happiness of the greatest number," as the end of all true moral action, Utilitarianism takes its more modern shape. "Nature," he said, "has placed mankind under the government of two sovereign masters, Pain and Pleasure. It is for them alone to point out what we ought to do." In J. S. Mill Utilitarianism assumes its present, which may be safely said to be its highest, form. There, the happiness of the race is announced as an end to be pursued by the individual, even though he should be obliged to renounce his own in its attainment. A place is found for the martyr's effort, but that effort must be in accordance with the great principle of Utilitarianism, or it is worse than useless. Moreover, happiness is here no low or degrading

Utilitarianism

conception, for there is quality as well as quantity in pleasures, and a lower pleasure must yield to a higher — the senses to the intellect, the body to the mind. Those who have had experience of both may be taken as judges of the question. They have uniformly given the palm to the higher pleasures, and from their decision "I apprehend there can be no appeal." By careful moral education the conscience of the individual is to be so developed that its force in the direction of right action will be all-powerful.

That Utilitarianism is a theory of great plausibility, and that it can urge a great deal in support of its position, is evident from the preceding historical sketch. It is, so to speak, a self-contained theory; it does not require to go beyond the obvious facts of existence to support its claims; it is plain, simple, and direct; it affords an easy and safe rule for the solution of all disputed questions of morals; and it is in obvious agreement with a vast number of the most patent facts of life. Many arguments have been employed against Utilitarianism. It has been urged: (1) That our powers have various ends, how then can happiness be the end of them all? (2) That all actions producing happiness are not regarded as moral actions. All actions producing pain are not wrong actions. (3) That pain may be used as a means to good, but we must not do evil that good may come of it. (4) That we cannot always calculate beforehand whether the effects of an action will be good or bad. Human life is too complex, and the knowledge an individual has of it is too small to allow him to judge with perfect certainty. Besides, men will take different views of such questions, and thus the moral standard will at best be but a fluctuating one. These objections have been more or less effectively met by the advocates of Utilitarianism, but the gravest objection to the doctrine is (5) that it has no proper theory of duty — the word "right" has no deep true meaning in this system.

This will appear from a little reflection. If my interest conflicts with that of the race, if it urges me to do an immoral act, shall I not simply show strength of intellect and a wise perception of my own individual position if I disregard anything but my own interest? My conscience, it is true, tells me not; but what is this conscience? According to Professor Bain's analysis, it is a triple compound placed in me by education, and composed (1) of fear, since the child finds its wrong-doing punished; (2) of respect, since the child respects those who are older and wiser, and who instruct and guide; (3) of utility, since the child finds when it grows up that the prohibitions and commands laid upon it in infancy had a deep and wise meaning. Mill, by an analysis substantially similar, says

that a feeling, a pain more or less intense on the violation of duty, is of the essence of conscience, and that this feeling implanted by education is one of sympthy and fellow-feeling with the race. Now, all this is true no doubt, but still it hardly covers the difficulty. Conscience may consist of any combination of feelings, however powerful and sacred, but will not their disregard on convenient occasions be simply an exhibition of rational strength? This, then, is a weak spot in Utilitarianism, a joint in the harness and unfortunately just over the heart of the system. The best answer that can be attempted seems the following: On a utilitarian theory it must be admitted that there is no such thing as absolute good or evil, or absolute moral duty. But humanity has created a morality for itself, and he who departs from it is a wrongdoer, inasmuch as he sins against the race. This relative right- and wrong-doing is all that the circumstances of the case admit. It is to be noted that in the later utterances of Utilitarianism the religious element is only introduced in a side manner. Of course, in a theory like this, all the difficulty as to a motive force is got over when we adopt a system like Paley's; on any other system the answer must be as given above. It is to be carefully noted that even if we reject Utilitarianism we are not forced to adopt the contrary system of Intuitionalism. The systems are contrary, and not contradictory; they may both be false, though both cannot be true.

**Utopia,** the name given by Sir Thomas More, to the imaginary island which he makes the scene or his famous political romance "The Ideal Republic, which is the New Island of Utopia." More represents this island as having been discovered by Raphael Hythloday, a companion of Amerigo Vespucci, but it of course is England, its capital Amaurote, London. Its laws and institutions are represented as described in one afternoon's talk at Antwerp, occupying the whole of the second book, to which, indeed, the first serves but as a framework. More's romance, or rather satire, obtained a wide popularity, and supplied (though incorrectly enough) the epithet Utopian to all impracticable schemes for the improvement of society.

**Utrecht,** an important town of Holland; capital of a province of the same name, 23 miles S. E. of Amsterdam. It is is pleasantly situated on the Old Rhine, is traversed by two canals crossed by numerous stone bridges, and is surrounded by strong forts. The town is well built, and has several squares, promenades, a government house, a Protestant cathedral (a fine Gothic building), mint, handsome town hall, palace of justice, etc. Educational establishments include a well-equipped university, a veterinary school, musical college, and schools for drawing and architecture. Utrecht is the central point of the Dutch railway system, and carries on an extensive trade in grain and cattle, and in the manufactures of the place, which include Utrecht velvet, carpets, floor cloth, cottons, linens, chemicals, etc. Utrecht is the oldest town of Holland and was called by the Romans *Trajectum ad Rhenum*, that is "Ford of the Rhine," later *Ultra-trajectum*. Pop. (1906) 114,321. The province of Utrecht has an area of 534 square miles; pop. (1906) 276,543. It is generally flat, is well watered by the Rhine, Vecht, Amstel, etc., and is better suited for dairy farming and stock rearing than for corn growing.

**Utrecht, Peace of,** a series of separate treaties agreed on at Utrecht by the powers which had been engaged in the war of the Spanish Succession. On April 11, 1713, the States-General, Prussia, Portugal, and Savoy, signed separate treaties with France. The emperor refused to accede to the peace, and his differences with France were subsequently adjusted by the treaties of Rastadt and Baden in 1714. By the treaty with England, France, among other things, recognized the Hanoverian succession, engaged never to unite the crowns of France and Spain, and ceded to England Nova Scotia, Newfoundland, St. Kitt's and Hudson Bay and Straits. Gibraltar and Minorca were also ceded on behalf of Spain. Holland retained the Spanish Netherlands till a barrier treaty was arranged with Austria. Louis XIV. recognized the title of the King of Prussia, who received a part of Spanish Guelderland, and the sovereignty of Neufchâtel in Switzerland, while renouncing the principality of Orange. Savoy and Nice were restored to the Duke of Savoy, who was recognized as presumptive heir to the Spanish monarchy, and received the title of king. Philip V. was not recognized till the conclusion of these treaties, but France treated for Spain, and formal treaties corresponding with those with France were afterward signed with that power.

**Utricle,** a one-celled, one- or few-seeded, superior membranous fruit, frequently dehiscing by a transverse suture, as in *Chenopodium*. Also a fruit with a thin skin and a single seed. Sometimes this word is employed to express a separate cell of the cellular tissue of a plant, which is usually a little vegetable bladder.

**Utricularia,** a genus of plants, order *Lentibulaceæ*, composed of aquatic herbs, loosely floating or fixed in the mud; leaves radical, multifid or linear, and entire, mostly furnished with little inflated vesicles; scape erect. *U. vulgaris*, the common bladder wort, and *U. inflata*, the whorled

bladder wort, are found in stagnant pools throughout the United States.

**Uva,** a succulent indehiscent fruit, with a central placenta and a very thin outer pericarp. Examples: the fruit of the vine, that of solanum, etc. Deemed by most botanists an unnecessary term. In pharmacy: raisins; used only to sweeten preparations.

**Uvaria,** a genus of *Xylopeæ*; flowers hermaphrodite, petals equal, stamens flattened, ovaries linear, cylindrical, inserted, as are the stamens, into a flat receptacle. Natives of tropical or sub-tropical countries in the Eastern Hemisphere. The roots of *U. narum*, a large, woody, Indian climber, yield, by distillation a sweet-scented, greenish oil, used in various diseases in Malabar. The aromatic root is also employed medicinally. The bruised leaves smell like cinnamon. The bark of *U. tripetaloidea*, when tapped, yields a viscid and fragrant gum. The leaves of *U. triloba* are applied to languid abscesses to bring them to a head. The fruit of *U. febrifuga* is regarded by the Indians of the Orinoco as an excellent febrifuge.

**Uva Ursi,** Tournefort's name for the genus now called *Arctostaphylos*. The name is still retained as a convenient abbreviation in pharmacy, bear berry leaves being called *Uvæ ursi folia*.

**Uvitic Acid,** $C_9H_8O_4 = C_6H_3(CH_3)(CO\cdot OH)_2$; a dibasic aromatic acid, obtained by boiling pyroracemic acid with excess of baryta water. It crystallizes in fine needles, difficultly souble in water, more readily in alcohol and ether, and melts at 287°. Heated with lime to 350°, it yields calcic carbonate and metatoluate, at a higher temperature yielding toluene.

**Uvula,** a small fleshy protuberance which hangs at the middle of the posterior margin of the soft palate. In the case of sore throat, it frequently becomes enlarged and inflamed, and is to be treated by the application of stimulants and astringents in gargles. When other means fail, it may be amputated, an operation neither painful nor dangerous.

**Uvularia,** a genus of plants, order *Liliaceæ*. The mealy bellwort, *U. perfoliata*, is a handsome, smooth plant, found in woods in the United States and Canada; stem 10–14 inches high, passing through the perfoliate leaves near their bases, and dividing into two branches at top; flowers pale-yellow, pendulous from the end of one of the branches.

**Uvulawort,** the *Campanula trachelium*, the nettle-leaved bell flower. Leaves ovate, lanceolate, hispid, coarsely doubly serrate; peduncles generally few flowered; racemes panicled; corolla bluish-purple. So named because it was supposed to be of use in swelling and pain of the throat.

**Uwarowite,** a variety of garnet of an emerald-green color, in which a part of the alumina is replaced by sesquioxide of chromium. Originally from the Ural Mountains, but now found, though sparsely, in several other parts of the world.

**Uxbridge,** a market town of Middlesex, England; on the Colne, 16 miles W. of London. It has one church, St. Margaret's, restored 1872; another, St. Andrew's (1865), with a spire of 170 feet; a town hall (1836); and a spacious corn exchange (1861). Pop. (1901) 8,585. Commissioners met here in January, 1645, to discuss terms of peace between Charles I. and the Parliament, but separated the month after without coming to any agreement.

**Uxmal,** a ruined city in the N. W. of Yucatan; 40 miles S. W. of Merida, with vast remains of ancient grandeur, temple terraces, etc.

**Uz,** in the Old Testament, a region probably lying to the E. or S. E. of Palestine, known as the scene of the story of Job.

**Uz, Johann Peter,** a German poet; born in Ansbach, Germany, Oct. 3, 1720. He wrote several spirited popular songs and ballads; "Lyric Poems" (1749); a comic poem in Alexandrine verse, "The Victory of the God of Love"; a didactic poem, "The Art of being Always Cheerful" (1760); and a number of "Epistles," some of them entirely in verse. He died in Ansbach, May 12, 1796.

**Uzanne, Louis Octave,** a French author; born in Auxerre, France; Sept. 14, 1852. He was editor successively of three periodicals devoted to bibliography, the last being "Le Livre Moderne." Among his works are monographs on "The Fan," "The Umbrella," etc.; also "The Caprices of a Book-Lover" (1877); "Her Highness, Woman" (1884); "Our Friends, Books: Talks on Curious Literature" (1886); "Modern Bindings"; "Physiology of the Quays of Paris" (1890); "The Bachelor's Prayer-Book" (1890).

**Uzbeks.** See Tuaregs.

# V

**V**, the 22d letter, and the 15th consonant of the English alphabet. It represents a labial or labio-dental consonant sound, and is produced by the junction of the lower lip and upper teeth, as in ov, eve, vain. The sound of v differs from that of f, which is produced in the same way, in being voiced, while that of f is breathed. Both v and f are also continuous consonants, and also belong to the class of the spirants. V in Middle English is commonly written u in MSS., and conversely u sometimes appears as v, most frequently at the beginning of words, and especially in the word vs, vse, vp, vnto, vnder, and vn–, used as a prefix. As noted under U, u and v were formerly the same letter, and in dictionaries and alphabetical lists words beginning with U and V were, up till a comparatively recent date, combined. [U.] The Latin v, or rather consonant u, was probably pronounced as w: as in *vespa* = wasp. A very large proportion of the words which begin with v are of French or Latin origin, only vane, vat, vinewed, and vixen being English. The letter v did not exist in Anglo-Saxon, its sound being represented by f, as in *heofon* = heaven, of = of (*ov*). [F.] By this may be explained the change of consonant in the plurals in such words as thief, plural thieves, wolf, plural wolves, etc. V frequently replaces f, as in vat = Middle English fat; vetches = Middle English fetches (at the present day so pronounced in the Midland counties), etc. In the dialects of the S. of England v is still commonly used when other dialects had f: as vo = foe, vinger = finger, etc. V in some Romance words represents ph, as vial = phial, Middle English, visnomy = physiognomy, etc. V has been changed to (1) w in periwinkle = French *pervenche*, Latin *perivinct;* (2) to m in malmsey = Middle English malvesie, Old French, *malvoisie*. In vulgar speech, especially of Londoners, v is sometimes used for w, and, conversely, w for v; as vell for well, wery for very. V never appears as a final letter in English (though a final v sound often occurs), nor is it ever doubled.

V as a symbol is used: (1) As a numeral: For 5, and with a dash over it for 5,000. (2) In chemistry: For the element vanadium. (3) In heraldry: For vert, in the tricking of arms with a pen and ink. (4) In law: For *versus* (Latin = against); as, John Doe v. Richard Roe. (5) In physics: For velocity or volume. (6) In music: As an abbreviation of violino, violini, voce, volta, etc. (7) In finance: For $5; as, I'll give a V for it (from the letter V on the bill). (8) In electrics: As a symbol for volt.

**Vaal** (Dutch, yellow; its Hottentot name, Ky Gariep, has the same signification), a large river of South Africa, rising in the Drakenberge range, and flowing W. and S. W. along the N. border of the Orange River Colony, and through the most N. portion of Cape Colony, to its junction, after a course of some 500 miles, with the Nu Gariep or Orange river.

**Vaalite** (after the Vaal river, South Africa), a monoclinic mineral, occurring in hexagonal prisms in an altered enstatic rock and in the "blue ground" of the diamond mines of South Africa. Composition: A hydrated silicate of magnesia, alumina, and sesquioxide of iron. On heating, it expands to six times its ordinary size.

**Vacation Schools,** in the United States, schools conducted for the purpose of teaching useful occupations to the poor children of large cities. The idea originated in Boston, where the first school was held during six weeks of the summer of 1885. From Boston the movement spread to New York, Chicago, and other large cities. New York had in 1897 10 vacation schools, all established and maintained in public-school buildings by the Association for Improving the Condition of the Poor. The average daily attendance in these schools exceeded 6,000. The school at the corner of Bayard and Mulberry streets may be used to illustrate conditions found in all. Here, in Grammar School No. 23, a model building facing a new park, 600 children passed six weeks from 9 A. M. till 12 M. The neighborhood was notified of the school and its purposes by notices posted on the doors of the school building, one in Italian, one in Hebrew,

and one in English. In response, 600 pupils presented themselves. No American or English names were on the roll after they were entered, and 29 different languages were spoken in the homes from which the children came. The appealing thing in this school was the little mothers, the babies with their families. Fully one-tenth of the children in room after room were able to come only by bringing in their care the younger brothers and sisters from home. Mere babies themselves, they carried about and entertained fat, jolly baby brothers or puny little things who needed the care the teachers had often to give. Indeed, the principal said of her kindergarten teacher that she was rarely without a baby in her arms as she went about her work. All the New York schools carried out the general vacation-school idea — no text-book work, good manual work to awaken the interest and bring out undeveloped ability, and the keeping in pleasant quarters of those who otherwise would be on the street.

Chicago has had several experiments, all of which have proved eminently successful. The work began there through the efforts of Miss Mary E. McDowell, the head resident of the University of Chicago Settlement. With Miss McDowell the attempt arose from her own experience in watching the destructive influences of the long summer days as they came to children who, having in their own homes nothing cheering from one week's end to another, found their only brightness in the street. There are more than 100,000 such children of school age in Chicago. As a result of her efforts, Chicago had in the summer of 1896 the Medill Vacation School, followed the next year by the Seward School, named in each instance from the public-school building occupied. Before the public schools closed the teachers in several neighboring schools were asked to furnish lists of their truant, disorderly, difficult pupils. Tickets were given to these, and when the vacation schools opened they were taken first, to the number of 300, and many were turned away. A noticeable feature was the fact that those who came once came regularly afterward, were always on time, and after a while appeared with clean hands and faces. A large share of the success of the school came from the sloyd, for the boys in the beginning were attracted by the carpenter shop, and boys and girls alike took the work. From the day the school opened till the end of the term the interest never flagged.

**Vaccination,** the act or art of vaccinating; the introduction of vaccine matter into the human frame with the view of protecting it against smallpox, or rendering that disease less formidable. It was at first supposed that the Cowpox (*q. v.*) had arisen by the transmission to the cow of a disease in the horse called "grease," the purulent matter of which was largely employed by Jenner and others for vaccinating purposes, at first after it had been passed through the cow and afterward by direct transmission. Its employment has long since been abandoned. The cowpox is not produced in the human frame by effluvia; actual inoculation is required. When vaccine lymph is introduced into the arm of an infant, by one or more punctures of a lancet, no noticeable effect is discernible for two days. Then a slight papula arises, which, on the 5th or 6th day, becomes of a bluish color and vesicular, with a raised head and a central cup. On the 8th day it reaches full development, and an inflammatory areola appears, which spreads with the extension of the vesicle for two more days. Then a crust or scale is produced in the center of the vesicle, and gradually extends till it covers it in every part. On the 14th or 15th day the scale becomes hard and brown; it next contracts, dries, and blackens, till, between the 20th and the 25th day, it falls off, leaving a permanent circular, depressed, and foveated cicatrix. Unless it possesses all these characters, and specially unless foveation be present, vaccination is imperfect, and cannot be relied on as a prophylactic against smallpox.

It has been established also that four, or at least two, such cicatrices are essential for protection, and that the operation should be repeated in 10 to 12, or, at most, in 14 years. Various objections have been brought forward against vaccination; the only one to which importance is attached by medical men is that a danger exists of introducing syphilis into the frame by the use of infected lymph. Dr. Farr deduced from the statistics of smallpox epidemics that if 100,000 vaccinated persons be exposed to certain risks of contagion, 100 will be attacked, 10 of whom will die; while if 100,000 unvaccinated people be exposed to the same risks, at least 600 will be attacked, of whom 270 will die. The English commission of 1873 settled the question in the minds of legislators, as all statistics have since done. The German Vaccination Commission of 1884 came to the following conclusions:

"With rare exceptions, one survived attack of smallpox confers immunity against subsequent attacks. Vaccination exerts a similar protection. The duration of the protection varies within wide limits, but is, on the average, ten years. At least two well-developed vaccine vesicles are necessary to insure an efficient protection. Revaccination is necessary ten years after primary vaccination. The vaccinated condition of the community increases the relative protection against smallpox acquired by the individual and hence vaccination is beneficial not only individually but generally. Vaccination may have an injurious effect under certain circumstances. In the use of human lymph, the danger of transferring syphilis, however slight, cannot be entirely excluded. Any other bad effects are apparently only due to the consequences of the wound, *e. g.*, erysipelas, etc. All these dangers may by precaution be reduced

to such a minimum as to make the benefit of vaccination infinitely outweigh them. Since the introduction of vaccination, no scientifically proved increase of any particular disease or of the general mortality has occurred. Since the dangers to health and life (vaccination syphilis, etc.) occasionally connected with the use of human lymph can be avoided by the use of animal lymph, and since vaccination with animal lymph has been recently so perfected as almost to equal vaccination with human lymph, the latter is to be gradually superseded by animal lymph."

Anti-vaccinationists allege: (1) That vaccination does not prevent smallpox. (2) That it does not mitigate smallpox, since in Scotland in 1871 there died of smallpox 517 vaccinated infants in the first year of life, and therefore within an average of six months of their vaccination, these alone being one-tenth of the total victims in that country. (3) That vaccination is itself a grave danger to life and health, as proved by the great increase, since the enforcement of vaccination by law, in infant mortality from diseases confessedly inoculable — skin diseases having increased 187 per cent., scrofula 259 per cent., syphilis more than 300 per cent., in children in the first year of life. In most of the cities and towns of the United States civic ordinances require the vaccination of children before their admission to the public schools.

**Vaccinic Acid,** Lerch's name for an acid he obtained by the saponification of butter from cow's milk. It appears to have been a mixture of butyric and cupric acids.

**Vacciniaceæ,** cranberries; an order of epigynous exogens, alliance Cinchonales. Much-branched shrubs or small trees often evergreen, somtimes parasitic. Leaves alternate entire, often with glandular notches, exstipulate; flowers solitary or in racemes; calyx, superior, entire, or with four to six lobes. Corolla monopetalous, with the same number of divisions as the calyx, imbricated in æstivation; stamens inserted in an epigynous disk, twice as many as the lobes of the corolla; anthers two-horned. two-celled, bursting by pores. Ovary inferior, with 4 to 10 cells, each with one or many minute seeds. The species occur in temperate regions, in swamps or subalpine districts. They are widely diffused over both hemispheres. Their bark and leaves are astringent, their berries pleasantly subacid. Known genera, 14; species, 200.

**Vaccinieæ,** in botany, a sub-order of *Ericaceæ,* having the buds clothed with scales, the stamens epigynous, and the ovary inferior. It is equal in extent with the order *Vacciniaceæ.*

**Vaccinium,** the whortleberry; the typical genus of *Vacciniaceæ.* Shrubs with alternate, and, as a rule, evergreen leaves; calyx tube short, limb four or five-toothed; corolla, urceolate or campanulate, four to five cleft; stamens, 8 to 10; berry globose, four tc five-celled. Known species, about 100, from America, Europe, and Asia. *V. Oxycoccus,* of Linnæus, is now *Oxycoccus palustris.* The cowberry has rigid, wiry, tortuous stems, evergreen obovate leaves dotted beneath, terminal drooping racemes of pale flesh-colored flowers, open at the mouth and with spreading segments. It is found on heaths and mountains or in woods, and is diffused here and there in the N. of Europe, Siberia, and North America. *V. leschenaultii,* growing on the mountains of Southern India and Ceylon from 4,000 to 8,000 feet high, bears an edible fruit. A species occurs in the Miocene and one in the Pleistocene.

**Vachellia,** in botany, an old genus of *Acacieæ,* now reduced to a sub-genus of *Acacia,* or altogether merged into that genus. *V. farnesiana,* now *Acacia farnesiana,* is a large shrub or small tree, with bipinnate leaves having four to eight pinnæ, each with 10 to 20 pairs of narrow, blunt leaflets. The flowers, which are in little globular heads, are the Cassie flowers of commerce, which, macerated in fine olive oil, yield a perfume like that of violets. The tree seems to be indigenous only in the tropics of America, but it is now cultivated in most hot countries, and has extended even to the S. of Europe.

**Vacherot, Etienne** (väsh-rō′), a French philosopher; born in Langres, France, July 29, 1809; was educated at the Paris Normal School, where he succeeded Cousin as Professor of Philosophy in 1839; was dismissed for refusing to take the oath of allegiance when Louis Napoleon became emperor; imprisoned for a year for censuring the Napoleonic system; succeeded Cousin in the Academy of Moral Sciences in 1868; was one of the mayors of Paris during the siege. Was elected to the Assembly, and was one of the three deputies of Paris who voted in favor of making peace with Germany. He wrote a "Critical History of the School of Alexandria" (3 vols, 1846–1851); "Democracy" (1859); "Metaphysics and Science" (2 vols. 1858); "Essays in Critical Philosophy" (1864); "Religion" (1868); "Science and Conscience" (1870); "The External Policy of the Republic" (1881); "The New Spiritualism" (1884). He died in Paris, July 30, 1897.

**Vacquerie, Auguste** (väk-rē′), a French dramatist; born in Villequier, Seine-Inférieure, France, Nov. 19, 1819. Besides two volumes of miscellaneous poems, he wrote the comedies "Tragaldabas" (1848); "Man Changes Oft" (1859); and "Jean Baudry" (1863); "Jealousy" (1888), a drama in verse; "Crumbs of History" (1863); "My Early Years in Paris" (1872); "To-day and Tomorrow" (1875). He died in Paris, Feb. 19, 1895.

**Vacuole,** in biology, a cavity, chiefly that formed in the interior of a mass of

protoplasm by the filtering into it of drops of water. It is used in this sense of the blood corpsucles which are destitute of granules, but may be filled with water. The term, however, is chiefly applied to the apparently empty spaces in the protoplasm of the Rhizopoda, Infusoria, etc. These spaces are of two kinds — water-spaces comparatively persistent, and food vacuoles formed temporarily around particles of food generally enveloped in a drop of water. The term vacuole is used also of the cells which occur in the protoplasm of plants.

**Vacuum,** in physics, a portion of space void of matter. The possibility of the existence of a perfect vacuum has been a favorite subject of discussion among metaphysicians; and that the negative view was popular is indicated by the historical phrase "the vacuum which nature abhors." Descartes asserted that if the contents of a hollow vessel were taken out without anything entering to fill its place, the sides of the vessel would be in contact. This assertion, however, is based on the dogma that the only essential property of matter was its extension; that, in other words, matter was indistinguishable from space. Such inquiries, however, can lead to nothing definite. The experimental philosopher is obliged to recognize the practical impossibility of obtaining a perfect vacuum. The so-called Torricellian vacuum, which exists above the mercury column of a barometer, is really filled with mercury vapor probably mixed with a small percentage of air. The very action by means of which the air pump produces its vacuum shows that there can never be an absolute void — a little air always remaining behind. Andrews, following up a suggestion of Davy, obtained remarkable vacua by first pumping in carbonic acid so as to expel as far as possible the air, and then after ordinary exhaustion leaving the carbonic acid to be taken up by moistened caustic potash which has been previously placed in the receiver. In this way Andrews removed all but $\frac{1}{350000}$ of the gas originally present, whereas by ordinary air pump action only $\frac{119}{120}$ of the gas can be removed. Frankland, Gassiott, Crookes, Dewar, and others, have devised various improvements. Dewar takes advantage of the property of gases to condense on the surface of solids in a remarkably ingenious way. A piece of carbon, placed in the vacuum vessel, is kept heated while the vessel is being exhausted. After the exhaustion is completed as far as possible, the carbon is allowed to cool so as to permit the small quantity of gas present to condense in its pores. A gentle heating of the carbon at once releases a quantity of the gas, so that this method is invaluable in the study of electric discharges through rarefied gases, since the rarefaction can be so easily altered at will.

**Vacuum Tubes,** glass tubes in which a vacuum has been made and which have then been hermetically sealed, and into the opposite extremities of which platinum wires have been soldered, with an arrangement at the free ends of these whereby they may be connected with the secondary wires of an induction coil, or may, generally, be put into the circuit of an electric current. The object of this arrangement ("Geissler's tubes") is to pass a high-pressure current of electricity through the so-called vacuum, which is in reality a highly rarefied quantity of the particular gas (air, oxygen, nitrogen, etc.) with which the tube had been filled prior to exhaustion. When such a current passes, the residual gas glows with a bright light the color of which varies with the nature of the gas in the tube, the glow being brighter round the negative electrode, but being separated from it by a thin dark layer. The discharge is repelled, attracted, or made to turn round a magnet brought near it in the same way as a perfectly flexible current-bearing conductor would be. If any fluorescent substances, such as a solution of sulphate of quinine, or uranium glass, be placed round the rarefied gas, these will glow brightly with their own fluorescence colors, under the influence of the ultra-violet rays, in which the light of the discharge is rich. If a part of the tube be narrow the glow is broken up into disks or striæ, the cause of which is not clear. These striæ can in some cases be rendered less numerous and at a greater distance from one another by slowing the frequency of oscillatory discharge of each make-and-break of the induction coil. This can be done by interposing in the circuit a coil of numerous convolutions. The striæ are, however, observed when the current is apparently continuous, as when the source of electricity is a battery of 500 or more Daniell's cells.

Gassiott inferred that the discharge of the battery itself through a rarefied gas is not continuous but intermittent. The number and position of the striæ is altered by altering the resistance in the circuit. If the discharge is rapidly and regularly intermittent the glow is sensitive to the approach of a conductor connected with the earth or a large condenser, and is repelled or attracted thereby according to the arrangement of the apparatus. It is not necessary that the platinum terminals should be in contact with the wires of an electric circuit; it is sufficient to put them to widely different potentials, as by lowering the tube into the electric field between the knobs of a Holtz machine: the residual gas then glows without contact. The same thing occurs when the field is one of high potential and rapid alternation. If the vacuum be reduced to $\frac{1}{400000}$ of an atmosphere the current will not pass and there is no

glow. At about one-millionth of an atmosphere the molecules become so few that there are very few collisions between them. There is no light produced in the body of the gas unless these collisions occur. If the tube be less in its dimensions than the mean free path of the molecules the first collision of any given molecule leaving the negative electrode will probably be against the glass of the tube itself. The glass accordingly begins to glow with a bright phosphorescent light, but only at such points as can be reached by molecules leaving the negative electrode at right angles and traveling in straight lines. If the negative electrode be so formed as to concentrate the molecular impact on a diamond it will shine with a green light equal to that of a candle; a ruby or aluminum oxide, bright red; glass, green. The position of the positive electrode appears to have no bearing on the phenomenon.

Since the molecules travel in straight lines, any solid obstacle will cast a shadow, and the molecules exert mechanical force when they strike; and they also produce heat which can, when they are concentrated on a point, melt glass or even a piece of metallic iridio-platinum. These are phenomena of radiant matter or the ultra-gaseous state (Crookes) in which the ordinary properties of gases are profoundly modined by the absence of collisions between the molecules. Lenard, following up Crookes and Herz, discovered that the dark or invisible rays emitted from the vacuum tubes through an aluminum "window" would, in a dark box, take photographs; and in 1895 Röntgen of Würzburg found that these dark rays, the so-called Röntgen rays, when passed through the hand or other part of the body would imprint a shadow picture of the bones on a sensitive photographic plate — a discovery speedily applied in various ways, and utilized in surgery.

**Vadred,** or **Vadret, Piz,** a peak of the Alps in the canton of Grisons, Switzerland, 24 miles S. E. of Coire; height, 10,609 feet.

**Vagina,** the membranous canal leading from the uterus or womb to the external genitalia. The vagina in lower mammals, such as the *Ornithorhynchus,* opens into a cloaca, while in the kangaroos and other *Marsupialia* it opens into a canal named the uro-genital canal, which receives the efferent ducts of the urinary organs. In higher quadrupeds the vagina is distinct both from the rectum and the urinary ducts. In the human subject it attains a length of about four inches measured along its anterior wall and six inches measured on its posterior surface. It lies between the bladder and rectum; constricted at its commencement it becomes dilated towards its uterine end. The coats of the vagina number three — an external or muscular layer, a layer of erectile tissue, and an inner or mucous layer. The mucous layer is thrown into folds or rugæ, which permit the distension of the canal in the process of parturition.

**Vaginicola,** in zoölogy, the type genus of the sub-family *Vaginicolina,* with several genera from salt and fresh water. Animalcules elongate, sub-cylindrical, inclosed singly or in pairs within a vase-shaped sheath, to the bottom of which they are affixed directly, or by means of a pedicel; oral and ciliary systems as in *Vorticella.*

**Vaginitis,** in pathology, inflammation of the vagina. It may be acute or chronic. The former is sometimes produced by the poison of scarlatina; the latter is called also vaginal catarrh, vaginal leucorrhœa, simply leucorrhœa, and popularly the whites.

**Vaginulus,** in zoölogy, a genus of *Oncidiadæ,* with 20 species from the West Indies, South America, India, and the Philippines. Animal elongated, slug-like, covered by a thick, leathery mantle, under which the head is retracted at will; tentacles four, eyes on upper pair; sexes united. The species are found in decayed wood, and under leaves.

**Vagrants,** in the United States, persons going about from door to door, or begging on the highway, who may have no fixed place of residence in the township, ward, or district in which they are arrested. The punishment is labor on the poor farm, on the highways, or confinement in the jail, workhouse, etc., for a term of 10 days to six months.

**Vaigatch** (vī′gätsh), **Vaigatz,** or **Waigatch,** an island in the Arctic Ocean between Archangel and Nova Zembla. It belongs to Russia, and during the summer time is visited by many hunters and fishermen. The inhabitants are chiefly Samoieds, by whom it is called Khayodeya. Length, 60 miles; greatest breadth, 35 miles.

**Vail, Alfred,** an American inventor; born in Morristown, N. J., Sept. 25, 1807; was graduated at the University of the City of New York in 1836, and in 1837 became associated with Samuel F. B. Morse in his experiments for the purpose of perfecting a scheme of telegraphy. His mechanical knowledge applied to the experimental apparatus resulted in the first available Morse machine. He invented the combination of the horizontal-lever motion to actuate the style; devised the alphabet of dots, spaces, and dashes which it necessitated; and in 1844 constructed the automatic lever and grooved roller which embossed on paper the characters which he originated. He was appointed assistant superintendent of the telegraph line constructed between Baltimore and Washington in 1843, and on

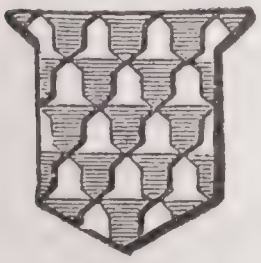
the completion of the system, in 1844, was stationed at Baltimore, where he invented the finger key and received the first message from Washington. He died in Morristown, N. J., Jan. 18, 1859.

**Vail, Charles H.,** an American clergyman; born in Tully, N. Y., April 28, 1866; was graduated at St. Lawrence University in 1892; studied theology and was ordained in the Universalist Church; was pastor of All Soul's Church, Albany, N. Y., in 1893–1894. In the latter year he accepted the pastorate of the First Universalist Church in Jersey City. In 1901 he was an unsuccessful candidate for governor of New Jersey on the Social Democratic ticket. His publications include: "Modern Socialism" (1897); "National Ownership of Railways" (1897); "Scientific Socialism" (1899); "The Industrial Evolution" (1899); "Mission of the Working Class" (1900); "Socialism: What It Is and What It Is Not" (1900); "The Socialist Movement" (1901); "The Trust Question" (1901); etc.

**Vaillant, François** (vī-yo*ng'*), a French ornithologist; born in Paramaribo, Dutch Guiana, in 1753. He passed many years in France and Germany, from 1764 on, studying the habits of birds. He spent 1780–1784 in South Africa, exploring among the Kaffirs, etc.; and returning to France, published the interesting "Journey in the Interior of Africa" (2 vols. 1790–1796). He barely escaped death in the Terror, 1793. He published a "Natural History of the Birds of Africa" (6 vols. 1796–1812), and several minor works on birds. He died near Sézanne, France, Nov. 22, 1824.

**Vaillant, Jean Baptiste Philibert, Comte,** a Marshal of France; born in Dijon, France, Dec. 6, 1790. He served in the Napoleonic wars, was at the siege of Rome in 1849, and was made a marshal; was minister of war in 1854–1859; fought at the battle of Solferino in 1859; commanded the army in Italy 1859–1860; was minister of the emperor's household in 1860–1870 and also minister of the fine arts a part of the time. He was banished in 1870, but returned to Paris the following year. He died in Paris, June 4, 1872

**Vair,** in heraldry, one of the furs, composed of several pieces, silver and blue (argent and azure), cut to represent little shields or (it is said) the flower of the campanula, and opposed to each other in rows. When of different colors, these are specified and described, vairé or vairy; as, vairy argent and vert.



VAIR.

**Vaiseshika** (vī-sā'shē-kä), one of the six leading systems of Brahmanic philosophy. At first only three of the six — viz., the two Mimânsâs and the Nyâya — were considered orthodox; but ultimately the three rejected — the Vaiseshika, the Sankhya, and the Yoga — were exempted from the ban of heresy. The founder of the Vaiseshika system was Kanâda, whose exact date is unknown, but it may be vaguely conjectured at about 500 B. C. The system assumes or establishes that all material substances are composed of atoms mechanically united. These atoms it regards as eternal in their duration. The combinations of them which form the present world are, however, but transitory; so also is the present system of things. The Vaiseshika philosophy is generally connected with the Nyâya or Logical school of Gautama, of which it is supposed to be a modification.

**Vaishnava** (vīsh'nä-väz), a primary religious section of the Hindus, who adore Vishnu in preference to, if not to the exclusion of, the other persons of the Hindu triad. To carry individual preference to this extent is not considered orthodox, and many of those who do so have united themselves into monastic bodies, which, drawing their devotees from various castes, virtually merge them in a new one — that of the Sectarian brotherhood. Horace Hayman Wilson divided the Vaishnavas into the following sections: (1) Rámánujas, Sri Sampradáyís, or Sri Vaishnavas; (2) Rámánandis, or Rámâvats; (3) Kabír Panthís; (4) Khákís; (5) Malúk Dásís; (6) Dádú Panthís; (7) Ráya Dásis; (8) Senáís; (9) Vallabhácháris, or Rudra Sampradáyís; (10) Mírá Báís; (11) Madhwácháris or Brahma Sampradáyís; (12) Nímávats, or Sanakádi Samprayadáyis; (13) the Vaishnavas of Bengal; (14) Radhá Vallabhís; (15) the Sakhí Bhávas; (16) Charan Dásis; (17) Harischandís; (18) Sadhná Panthís; (19) Mádhavis; and (20) Sannyásís, Vairágís, and Nágas.

**Valaite,** a mineral belonging to the group of resins, occurring in small, hexagonal tables and massive, associated with hatchettite, in the Rossitz-Oslawaner Coal formation, Moravia; hardness, about 1.5 or lower; luster, shining; color and streak, black; aromatic odor when rubbed; fracture, uneven. Composition: Not yet determined.

**Valais** (vä-lā') (German, Wallis), a frontier canton of Switzerland; bounded on the N. by the cantons of Baud and Bern, and on the S. by Italy; area, 2,027 square miles; pop. (1905) 117,514. It forms one long and deep valley, included between two of the loftiest mountain chains of Europe — the Pennine and the Bernese Alps — and is drained by the Upper Rhone, which, rising at its N. E. extremity, falls at the W. boundary of the canton into the Lake of Geneva. The greater part of the surface

consists of barren mountain slopes — in their higher elevations covered with the greatest of the Swiss glaciers. The forests and pasture-lands supply the inhabitants with their chief occupations. The heat at the bottom of the valley, where there is a strip of corn land, is intense in summer, and Indian corn and the vine are grown with great success. The Grimsel and Gemmi passes connect the E. part of the valley with German Switzerland; and the Great St. Bernard and SIMPLON (*q. v.*) passes connect it with Italy. Sion and Martigny are the chief towns.

**Valckenaer, Lodewyk Kaspar** (väl'kenär), a Dutch philologist; born in Leeuwarden, Holland, June 7, 1715; studied at Franeker and Leyden, and in 1741 became Professor of Greek at Franeker, in 1766 successor to Hemsterhuis at Leyden. His works included editions of the Greek grammarian Ammonius (1739); the "Phœnician Women" (1755); and "Hippolytus" of Euripides (1768); the so-called "Epistles of Phalaris" (1777); "Theocritus," "Bion," and "Moschus" (1779–1781); and posthumously the "Fragments" of Callimachus (1799). He died in Leyden, March 14, 1785.

**Valdai Hills** (väl'dī), a range of hills in Western Russia, averaging about 300 feet in height, but rising in Mount Popovagora to 1,080 feet. They are well wooded, and contain the sources of the Volga, Dnieper, and Düna.

**Valdenses.** See WALDENSES.

**Valdés, Armando Palacio** (väl-dās'), a contemporary Spanish novelist and critic, residing at Oviedo, Spain. A representative of the new realistic school of Spanish fiction, he is best known to English readers by the powerful novels "Maximina" (1888) and "Sister St. Sulpice" (1890), translated by N. H. Dole. Next in importance are: "The Marquis of Peñalta" (English translation 1886); "Idyl of an Invalid"; "José"; "Riverita" (of which "Maximina" is a sequel); "Froth." His critical works include: "The Athenian Orators"; "Spanish Novelists"; "New Journey to Parnassus."

**Valdes, Gabriel de la Concepcion,** known as PLACIDO, a Cuban poet (colored); born in Havana, in 1809. He spent his early years in poverty. In 1836 he resided in Matanzas, and published many poems in newspapers and reviews; some of them cost him several months' imprisonment. In 1844 he was falsely accused of implication in a conspiracy of blacks against whites, and was shot as a traitor with 19 others in Havana, June 28, 1844. He was one of the most popular of Spanish-American poets; his poems have passed through numerous editions at home and abroad; the best is his prayer composed on the eve of death and recited on the way to execution, translated into English by Mary Webster Chapman.

**Val de Travers** (väl duh trä-vār), a valley in the Swiss Jura, canton of Neufchâtel, drained by the Reuse flowing into the lake of Neufchâtel. It is cultivated in parts, and contains a deposit of asphalt, yielding annually upward of 2,000 tons. See ASPHALT.

**Valdivia,** a town in the S. of Chile; capital of a province of the same name; on the Valdivia river, 9 miles from its mouth, with a safe and roomy harbor. The entrance to the river is fortified. The town is built on level ground, and is embosomed in apple orchards, surrounded by the native forest. It has an active coasting trade, chiefly with Valparaiso. Valdivia was founded in 1551 by Pedro de Valdivia, one of Pizarro's lieutenants, who named it after himself, and it was at one time a place of great wealth. The province of Valdivia has an area of 8,352 square miles. Besides splendid forests it has large upland pastures, and deposits of coal are known to exist within it. Pop. province (1907) 118,842; town (1907) 15,229.

**Valdivia, Pedro, de,** a Spanish military officer; born in Estremadura, Spain, about 1498; was on military service in Flanders; removed to Venezuela in 1534; and two years later joined Pizarro against the Indians in Peru. Under that conqueror he aided in the defeat of Almagro at Las Salinas. Later he led 150 Spanish and several thousand Indians in an expedition against Chile, which had been ceded by Charles V. to Pedro Sanchez de Hoz. After defeating a large force of Indians he established Santiago on Feb. 12, 1541. Subsequently the Spaniards were many times attacked by the Indians and were cut off from Peru. In December, 1543, reënforcements arrived and the colony thereafter prospered. In September, 1544, Valparaiso was founded, and in 1546 Valdivia marched into the Araucanian district, and in a great battle conquered the Indians. In 1547–1549 he joined Gasca, the royalist, against Pizarro, whom they defeated. In 1550–1552 he established Concepcion, Valdivia, and other places. A wide uprising of the Indians occurred in December, 1553, and while Valdivia was endeavoring to put down this revolt he was captured and put to death, it is supposed, on Jan. 1, 1554.

**Valeggio** (vä-led'jō), a town of Italy, in the province of Verona, on the Mincio; 14 miles S. W. of the city of that name. It has a fortified bridge or causeway, built in 1393 by Visconti, which is 1,800 feet long, with lofty towers at each end. Here, May 30, 1796, the French under Kilmaine defeated the Austrians under Beaulieu.

**Vale, Ladies of the.** See LADIES OF THE VALE.

**Valence** (vä-lo*ngs*′), a town of France, capital of the department of Drône; on the Rhone; 57 miles S. of Lyons. It is surrounded by orchards, vineyards, and woods; has an important trade; and manufactures of silk goods, metal goods, etc. Its principal edifices are the cathedral, with the tomb of Pope Pius VI., barracks, citadel, court house, prison and theater. It has a communal college, a public library of 20,000 volumes, school of artillery, school of design, dock for shipbuilding, cotton printing and dyeing establishments, etc. Pop. (1901) commune, 26,946.

**Valencia,** a seaport of Spain, formerly capital of the kingdom, and now of the province of the same name; on the shores of the Mediterranean; 3 miles from the mouth of the Guadalaviar and 200 miles S. W. of Barcelona. In the Huerta ("garden") surrounding the city the carob, citron, orange, palm, and mulberry grow in wild luxuriance. The old picturesque battlemented walls, erected by Pedro IV. in 1356, were removed in 1871; and while, in the old quarters, the houses are closely packed and gloomy-looking, well suited to keep out the heat, those recently erected are gaily colored and furnished with courts freshened with flowers and cooled by fountains. Valencia is the see of an archbishop, and its cathedral, which was commenced in 1262, classical in the interior, and Gothic on the exterior, is 350 feet long. The church of the Colegio de Corpus is quite a museum of pictures by Ribalta. The picture gallery contains chiefly the productions of the Valencian school (Juanes, the Ribaltas, Ribera, etc.). The university has a library of 42,000 volumes. The custom house, dating from 1758, is now a cigar factory. Silk spinning and weaving are extensively carried on; there are also manufactures of cloths, hats, glass, linen, leather, cigars, and Valencia tiles for flooring. The exports are mainly grain, silk, rice, and fruits. Pop. (1900) 213,530. Valencia, or Valentia del Cid, dating from the 2d century B. C., was destroyed by Pompey, taken by the Goths A. D. 413, by the Moors in 715, and by the Cid in 1094. The union of Ferdinand and Isabella brought it under the Castilian crown. Suchet captured the city in 1812. The old kingdom of Valencia, now subdivided into the three modern provinces of Valencia, Alicante, and Castellon de la Plana, comprises a tract of country in the E. of Spain, washed by the Mediterranean, and extending from Catalonia to Murcia. It has a hot but fine climate, a fertile soil, mineral wealth, and many industries.

**Valencia,** the capital and most important city of Carabobo, Venezuela; in the Aragua valley, 24 miles S. of Puerto Cabello; altitude 1,824 feet above sea-level. It is the third city of Venezuela in population and importance, and is the trade center of a large section handling sugar, hides, coffee, cocoa, etc. Here are electric lights, beautiful parks and squares, regular streets, a National College, a cathedral, etc. In the vicinity are celebrated hot springs. Valencia was established in 1555. After the separation from Colombia the first Venezuelan Congress met here. Pop. (1888) 38,654.

**Valencia, Lake of,** a bory of water in Venezuela, 2 miles from Valencia and near the Caribbean Sea; length, 22 miles; average breadth 4 miles. It contains many islands and is the outlet of the Aragua river.

**Valenciennes** (vä-lo*ng*-syen′), a fortified city of France, in the department of Nord; at the junction of the Rhondelle and the Schelde. It is noted for its manufactures of lace. It contains a citadel, a fine town hall, a communal college, civil and military hospitals, a library, museum, theater, arsenal, etc. Its industries are varied, comprising manufactures of batiste, linens, lawns, printed muslins, lace, beet sugar, gold and silver tissues, toys and leather. It also has foundries, rolling-mills, distilleries, glass works and dye works. It was taken in 1793 by the English and Austrians after a siege of six weeks. It was the birthplace of Froissart, Watteau, and Pujol. Pop. (1901) 25,055.

**Valens, Flavius,** Roman emperor of the East; born in Pannonia, in 328; declared emperor of the East by his brother Valentinian I., who had already been elected emperor. The chief event of his reign was the war with the Goths under Athanaric, which lasted during the whole of Valens' reign. The Goths were several times defeated, and sued for peace, which was granted them (370). In 377 the Goths, driven S. by the Huns, asked and received permission to settle on Roman territory. Irritated by the treatment they received at the hands of the imperial officials, they soon took up arms, and in 378 defeated Valens and destroyed the greater part of his army. Valens was never seen or heard of afterward.

**Valentia,** or **Valencia,** a small fertile island off the S. E. coast of Ireland, belonging to County Kerry, about 5 miles long by 2 miles broad. It has slate and flag quarries, and productive fisheries. The British Atlantic telegraph cables to Newfoundland start from Valentia, and there is here a lighthouse.

**Valentine,** a sweetheart or choice made on St. Valentine's day.

> "Tomorrow is St. Valentine's day,
> All in the morning betime!
> And I a maid at your window,
> To be your Valentine."
> — Shakespeare, "Hamlet," iv. 5.

According to the legend, St. Valentine was beheaded on Feb. 14, at Rome, under Claudius. The old notion was that birds began to couple on that day, and hence arose the custom of young persons of both sexes choosing each other as "valentines" for the ensuing year by a species of lottery, and of sending love missives to each other.

Also a letter or other missive sent by young persons of both sexes to each other on Valentine's day; a printed missive of an amatory or satirical nature, generally sent by post anonymously. Some valentines are highly ornamental and artistic, while others (commonly called "comic valentines") are caricatures, designed to reflect on the personal appearance, habits, character, etc., of the persons to whom they are addressed. The practice of sending valentines by mail appears to be diminishing year by year, the later practice, confined almost exclusively to children, being to insert them under the door of the person to whom they are addressed, and then to knock or ring the door bell and hurry away. In the various cities of the United States many millions of hideous caricatures thus change hands each year.

**Valentine, Basil,** a pseudonym framed to imply occult mastery over the metals (*Basilius,* "royal"; *Valentinus,* from *valeo*), the name given to the author of a series of alchemistic works, assumed to have flourished in Germany at the end of the 15th century. Kopp (in his "Alchemy") and Schorlemmer have proved that the actual author was Johann Thölde, who in 1612 published the "Halographia" under his own name, and in 1644 under that of Basil Valentine. A translation of "The Triumphal Chariot of Antimony" was published in 1661.

**Valentine, Edward Virginius,** an American sculptor; born in Richmond, Va., Nov. 12, 1838; studied anatomy at the Medical College of Virginia; began drawing under Couture; entered Jouffrey's atelier in Paris; was a pupil under Bouainti in Italy, and Kiss in Germany; and attended the Royal Academy of Arts in Berlin. He was president of the Richmond Art Club and the Valentine museum; one of the executive committee of the Virginia Historical Society; and a member of several patriotic and secret organizations. His works include, "The Nation's Ward"; "Unc' Henry"; several statues; the classic group of "Andromache and Astyanax"; a marble entitled "The Blind Girl"; bronze busts of prominent American generals and statesmen, and many ideal figures, etc.

**Valentine, Milton,** an American theologian; born near Uniontown, Md., Jan. 1, 1825; was graduated at Pennsylvania College, Gettysburg, in 1850; ordained in the Lutheran Church in 1852; held various pastorates in Virginia and Pennsylvania till 1866; then became Professor of Ecclesiastical History at the Lutheran Theological Seminary. In 1868 he was called to the presidency of the Pennsylvania College. He resigned that post in 1884 and became Professor of Systematic Theology and chairman of the faculty at the Lutheran Theological Seminary. He was joint editor of the "Lutheran Quarterly" in 1871–1876 and 1880–1885 and became the same again in 1898. His publications include "Natural Theology, or Rational Theism" (1885); "Theoretical Ethics"; "Christian Truth and Life"; etc. He died Feb. 7, 1906.

**Valentini, Philip Johann Joseph,** an American archæologist; born in Berlin, Germany, in 1828; studied philology at the Gymnasium of Targau, and later took a course in jurisprudence at the University of Berlin. He established Puerto Limon, a seaport of Costa Rica in 1854, and there discovered that the natives could tell nothing of their ancestry. He thereupon turned his attention to historical research which mostly had to do with the early Spanish settlements in Central America. He then studied prehistoric remains in Guatemala and adjacent regions. His work in deciphering pre-Columbian manuscripts and hieroglyphics was so successful that he became one of the most noted of American archæologists. One of his important achievements was the translation of the celebrated Mexican calendar stone. His publications include "The Landa Alphabet: a Spanish Fabrication"; "Mexican Copper Tools"; "The Olmecas and the Tultecas"; etc. He died in New York city, March 16, 1899.

**Valentinian,** a Roman emperor (364–375); born of humble family in Cibalis, Pannonia, in A. D. 321. By his capacity and courage he rose rapidly in rank under Constantius and Julian, and on the death of Jovian was chosen as his successor (Feb. 26, 364). He resigned the East to his brother Valens, and himself governed the West with watchful care down to his sudden death at Bregetio, Nov. 17, 375, brought on by a fit of passion. By his first wife he had one son, Gratianus, and by the second, Justina, another son, Valentinian II., and three daughters, one of whom, Galla, became the wife of the Emperor Theodosius I.

**Valentinian II.,** a Roman emperor; born in A. D. 372; received from his elder brother, Gratianus, the provinces of Italy, Illyricum, and Africa, as his share of the Western Empire. During his long minority the Empress Justina adminstered the government; and about three years after her death Valentinian was murdered by Arbogastes, the commander-in-chief of his army (392).

**Valentinian III.,** Emperor of the West; grand-nephew of the preceding, being the

son of Constantius III. by Placidia, the daughter of Theodosius the Great and Galla; born about A. D. 419, and was seated on the throne of the West by Theodosius II., emperor of the East, in 425. Valentinian was a weak and contemptible prince, and never really ruled during the 30 years that he sat disesteemed and unhonored on the imperial throne; his mother, Placidia, governed till her death in 450, and was succeeded by the eunuch, Heraclius, one of those malignant fribbles who swarmed around the throne of the falling empire. His treatment of Bonifacius made the latter throw himself into the arms of GENSERIC (*q. v.*), chief of the Vandals, and thus lost Africa to the empire. Aëtius, the buttress of his empire, he stabbed to death in a fit of envious jealousy (454), but next year was himself slain by Maximus, whose wife he had ravished.

**Valentinians,** in Church history, the followers of Valentinus, an Egyptian gnostic, whose sect arose at Rome, then rooted itself deeply in Cyprus, and finally spread throughout a great part of Southern Europe, Western Asia, and Northern Africa. He supposed that in the PLEROMA (*q. v.*) there were 30 male and as many female æons united in wedlock, with four unmarried, these latter being Horus, Christ, the Holy Spirit, and Jesus. The youngest æon, Sophia (Wisdom), brought forth a daughter, Achamoth, whence sprang the Demiurge, who created mankind. This Demiurge, becoming puffed up with pride, aspired to be regarded as the only god, and led many angels into the same error. To repress his insolence, Christ descended, Jesus, one of the highest æons, joining him when he was baptized in Jordan. The Demiurge had him crucified; but before his death, both Jesus the Son of God and the rational soul of Christ had separated, leaving only the sentient soul and the ethereal body to suffer. The Valentinians were divided into the Ptolemaitic, the Secundian, the Heracleonite, the Marcosian, and many other sects.

**Valentinite** (after Basil Valentine), an orthorhombic mineral, occurring mostly in crystals, but occasionally massive; hardness, 2.5–3; sp. gr., 5.566; luster, adamantine to pearly; color, white, peach-blossom red, ash-gray; streak, white; translucent to sub-transparent. Composition: Oxygen, 16.44; antimony, 83.56 = 100, whence the formula $SbO_3$. Results from the decomposition of various antimonial ores.

**Valenza,** a town of Northern Italy; province of Alessandria; on the right bank of the Po; 9 miles N. E. of Alessandria. Its cathedral is of the 16th century. Valenza has some manufactures and a trade in wine. Anciently a town of the Liguri, it was taken by Marcus Fulvius, who named it *Forum Fulvii, quod Valentinum.* After a siege of 90 days, it was taken by the armies of France, Savoy, and Parma in 1635, and its fortifications were razed by the French in 1805.

**Vale of Tears,** or **Valley of Baca,** this world.

"Our sources of common pleasure dry up as we journey on through the Vale of Baca."— Scott, "Antiquary."

**Valera y Alcala-Galiano, Juan,** a Spanish statesman and author; born in Cabra, Cordova, Oct. 18, 1824. He wrote: "Poems" (1858); "Critical Studies" (1864–1884); "Pepita Jimenez," a novel (1874); "The Illusions of Doctor Faustino" (1876); "The Commendador Mendoza" (1877); "Doña Luz" (1878); "New Studies" (1884); "Songs, Romances, and Poems" (1885); "Stories, Dialogues, and Fantasies" (1887); "A Good Reputation" (1895).

**Valeracetonitrile,** $C_{26}H_{48}N_4O_6$; a mobile, colorless liquid found in the neutral oil produced by distilling glue with potassium chromate and sulphuric acid. It has an aromatic odor, is very inflammable, burning with a faintly luminous flame, moderately soluble in water, soluble in alcohol and ether; sp. gr. 0.79 at 15°; boils between 68° and 71°.

**Valeral,** formula, $C_5H_{10}O = \begin{matrix}CH_3\\CH_3\end{matrix} > CH \cdot CH_2 \cdot CHO$; valeraldehyde, valerianic aldehyde, or valerylhydride; a mobile, colorless liquid, discovered by Dumas and Stas; obtained by oxidizing amylic alcohol with nitric or chromic acid, or by distilling fusel oil with sulphuric acid. It has a burning, bitter taste, a suffocating apple-like odor, exciting coughing, is insoluble in water, but soluble in all proportions in alcohol, ether, and volatile oils; sp. gr., .8075 at 17°, and boils at 96° under ordinary atmospheric pressure. It is very inflammable, burning with a bright blue-edged flame. When exposed to the air it is gradually converted into valerianic acid.

**Valeral Ammonia,** $C_5H_{10}O \cdot NH_3 = C_5H_9(NH_4)O$; a crystalline body prepared by adding ammonia to valeral mixed with a thousand times its bulk of water. It is almost insoluble in water, soluble in alcohol and ether, melts when heated, but recrystallizes on cooling.

**Valeraldine,** $C_{15}H_{31}NS_2$; a viscid oil obtained by passing sulphydric acid into valeral ammonia suspended in water. It has an alkaline reaction, a strong, unpleasant odor, does not solidify at —20°, is insoluble in water, soluble in alcohol and ether, and volatilizes without decomposition.

**Valeramic Acid,** $C_5H_{11}NO_2 = C_5H_9(NH_2)O_2$; amidovaleric acid, valeramidic acid; discovered by Gorup-Besanez in the pancreas of an ox, and prepared artificially by

the action of ammonia on an alcoholic solution of bromovaleric acid. It crystallizes in colorless leaves, somewhat sublimable, is slightly soluble in water and alcohol, insoluble in ether, and unites with acids and bases to form crystallizable compounds. Heated in the air, it burns with a bluish flame; heated in a glass tube, it melts and sublimes, giving off alkaline vapors having the odor of herring pickle.

**Valeramide,** $C_5H_{11}NO = C_5H_9O \cdot H_2N$, the primary amide of valeric acid, produced by the action of strong ammonia on ethylic valerate. Insoluble in water, melts at 100°, subliming at a somewhat higher temperature, and, when boiled with alkalies, gives off ammonia.

**Valerate of Potassium,** $C_5H_9KO_2$; obtained by saturating valeric acid with potassium. It is an amorphous, white, deliquescent, saline mass, soluble in water and in strong alcohol, melts at 140°, and decomposes at a higher temperature.

**Valeranilide,** $C_{11}H_{15}NO = C_5H_{10}(C_6H_5)NO$, phenyl-valeramide; a crystalline body, obtained by the action of valeric anhydride on aniline. It is slightly soluble in water, soluble in alcohol and ether, melts at 115°, and distills unaltered at 220°.

**Valerian (Valerianus, Publius Licinius),** a Roman emperor; born about 190. He was proclaimed after the death of Gallus in 253. He was defeated in the East by Sapor, King of Persia, and is supposed to have been flayed alive in 260.

**Valerian,** the type genus of *Valerianaceæ;* an order of herbs or rarely shrubs belonging to the division of monopetalous dicotyledons having the stamens arising from the petals. The order is distinguished from its congeners by the opposite leaves; small irregular flowers in which the corolla lobes are imbricate; stamens, one to three or five, free; ovary one to three celled, one cell one-ovuled; ovule pendulous; seeds exalbuminous. It contains 12 genera and about 190 species, distributed through Europe, Northern Africa, temperate Asia, and Northwestern America — unknown in Australia, and only one species South African. The properties are aromatic, antispasmodic, sometimes stimulant. The genus *Valeriana* numbers 130 species. Of these, *V. officinalis,* ranging across Northern and Central Europe and Asia to Japan, is a common British plant. Its rootstock has long been valued as an antispasmodic, and is successfully employed in hysteria. It has a penetrating odor, and a bitter, acrid, somewhat aromatic taste; when distilled with water it yields a volatile oil and valerianic acid. Cats have a strange liking for the odor, and it exercises a remarkable intoxicating or stimulating power over them; the plant is sometimes called cats' valerian. The roots of *V. celtica* are used by Eastern nations as a substitute for spikenard for aromatizing their baths, and those of *V. edulis* as an article of food by the Indians of Northwestern America. The red valerian (*V. pyrenaica*), a native of Southern France and Spain, has become naturalized in parts of Great Britain, and several other species are commonly grown in gardens. The word valerian is from Latin *valere,* "to heal," and one of the names of *V. officinalis* is "all-heal."

VALERIANA.

**Valerianaceæ,** valerianworts; an order of epigynous exogens, alliance Campanales; annual or perennial scented herbs, occasionally twining. Leaves collected in rosettes at the root, or distributed upon the stem, opposite, entire, or pinnately divided. Flowers in cymes; calyx superior, the limb membranous or resembling feathery pappus; corolla monopetalous, tubular, inserted in the top of the ovary, two or three lobed, regular or irregular, sometimes with a spur; stamens one to five, inserted into the tube of the corolla, and alternate with its lobes; ovary inferior, one-celled, sometimes with two other abortive cells; seed one, pendulous. Chiefly in temperate climates. Known genera 12; species 185.

**Valerianate,** in chemistry, a salt of valerianic acid. In pharmacy, valerianate of zinc is a nervine tonic, an antispasmodic, and an anthelmintic. Valerianate of iron and that of ammonia act somewhat similarly; valerianate of soda acts like valerian root; valerianate of quinine is useful in intermittent and spasmodic neuralgic affections.

**Valerianella,** in botany, corn-salad; a genus of *Valerianaceæ;* small annuals, dichotomously branched. Flowers small, bracteate, solitary or cymose in the forks of the branches; corolla regular, funnel-shaped; stamens three; fruit two or three celled, one-seeded. Known species about 50, chiefly from the N. temperate zone.

**Valerian Oil,** a pale yellow or greenish oil, obtained by distilling valerian root with water. It has the odor of valerian, an aromatic taste, an acid reaction; sp. gr.,

0.90–0.93; boils at 200°; becomes viscid at —15°, but does not solidify completely even at —40°. It appears to be a mixture of several substances.

**Valeric,** or **Valerianic Acid,** $C_5H_{10}O_2$, an organic acid present in valerian root, angelica root, in the berries of *Viburnum opulus*, and probably in many other plants. It is prepared artificially by oxidation of ordinary amyl alcohol ($C_5H_{12}O$), two atoms of hydrogen being removed and one of oxygen added. The most advantageous method of effecting the oxidation is to treat the amyl alcohol with a mixture of sulphuric acid and potassium dichromate. After a series of operations the acid separates as an oily liquid lighter than water and having the composition $C_5H_{10}O_2H_2O$. The water is driven off by distillation, and the pure acid obtained as a mobile colorless oil. It has a sharp acid taste, reddens litunes, and burns with a bright but smoky light. It has a density of .973, and boils at 175°. It forms valeriates with metallic oxides, but its compounds are not of much importance. Ethyl valerate ($C_2H_5C_5H_9O_2$) is formed by passing hydrochloric acid gas into an alcoholic solution of valeric acid.

**Valeric Anhydride,** $C_{10}H_{18}O_3 = ((CH_3)_2 \cdot CH \cdot CH_2 \cdot CO)_2O$; valeric oxide, valeric valerate; a colorless, mobile oil, prepared by distilling valerate of potassium with oxychloride of phosphorus, washing the distillate with sodic carbonate, dissolving in ether, and evaporating. It has a faint odor of apples; sp. gr., 0.934 at 15°; is soluble in ether, and boils at 215°. Water slowly absorbs it, converting it into valeric acid; with alcohol it forms ethylic valerate.

**Valeric Chloride,** $C_5H_9O_2Cl$; a colorless, mobile, fuming liquid, produced by the action of phosphorus chloride on valeric acid. It has a sp. gr. of 1.005 at 6°, boils at 117°, and is easily decomposed by water into hydrochloric and valeric acids.

**Valerins,** a series of glycerides obtained by heating valeric acid with glycerine: (1) Monovalerin, $C_8H_{16}O_4 = (C_3H_5)\cdot'''(HO)_2\cdot(C_5H_9O_2)$; an oily neutral liquid produced by heating valeric acid with excess of glycerine to 200° for three hours. It has a faint odor; sp. gr., 1.100 at 15°; mixes with half its bulk of water to a clear liquid, but separates on the addition of more water; is decomposed by alcohol, even in the cold. (2) Divalerin, $C_{13}H_{24}O_5 = (C_3H_5)'''\cdot HO\cdot(C_5H_9O_2)_2$; a neutral oily liquid, obtained by heating valeric acid and glycerine to 275°. It has a disagreeable, fishy odor; sp. gr., 1.059 at 15°, solidifies at —40°, and does not mix readily with water. (3) Trivalerin, $C_{18}H_{32}O_6 = (C_3H_5)'''\cdot(C_5H_9O_2)_3$; a neutral oily liquid, produced by heating divalerin to 220°, with 10 times its weight of valeric acid. It has an unpleasant odor, is insoluble in water, but soluble in alcohol and ether.

**Valerisic Acid,** Laurent's name for the substitution products of valeric acid, in which three atoms of hydrogen are replaced by chlorine or other radicles, *e. g.*, chlorovalerisic acid, $C_5H_7Cl_3O_2$. In like manner, those products in which four atoms of hydrogen are thus replaced are called valerosic acids.

**Valerodichlorhydrin,** $C_8H_{14}O_2Cl_2 = (C_3H_5)'''(C_5H_9O)O\cdot Cl_2$; a mobile liquid, produced by heating epichlorhydrin with valeric chloride to 100°. It smells like amylic acetate, has a sp. gr., of 1.149 at 11°, and boils at 245°.

**Valerius Cato, Publius,** a Latin poet and grammarian of the 1st century B. C. He wrote a short epic, "Diana" or "Dictynna," and "Lydia," an erotic poem. To him is ascribed the authorship of two poems in hexameters, both styled "Portents."

**Valerius Maximus,** a Roman anecdotist and rhetorician of the 1st century A. D. He wrote nine books of "Memorable Doings and Sayings" of historical characters, Roman, Grecian, and barbarian, all still extant.

**Valerone,** formula, $C_9H_{18}O = \left.\begin{matrix}C_4H_9\\C_5H_9\end{matrix}\right\} O$; valene, valeryl-butyl, or valeroyl-butyl-oxide; a transparent, colorless, mobile liquid, obtained by the dry distillation of calcium valerate, mixed with one-sixth of its weight of lime. It is lighter than water, has an ethereal odor and burning taste, soluble in alcohol and ether, sp. gr., 0.823 at 20°, and boils at 181°.

**Valeronitrile,** $C_5H_9N = C_4H_9\cdot CN$; butylic cyanide; a colorless oil, produced by heating valeric acid with potassic sulphocyanate. It has the odor of bitter almonds, sp. gr., 0.8164 at 0°, and boils at 140°.

**Valeroyl,** a name applied to the hydrocarbon $C_5H_9$, according to which denomination valerene may be designated as hydride of valeroyl, $C_5H_9H$; valerone as valeroyl butyloxide, $C_5H_9\cdot C_4H_9O$, etc.

**Valeryl,** $C_5H_9O$; valeroxyl; the radicle of valueric acid and its derivatives, obtained in the free state by the action of sodium on ethylic valerate for 24 hours. It is insoluble in water, soluble in alcohol, sp. gr., 1.027 at 0°, and boils at 224°–228°.

**Valerol,** produced by rapidly distilling valerian oil in a stream of carbonic anhydride. It crystallizes in colorless, transparent prisms, slightly soluble in water, soluble in alcohol, ether, and volatile oils, melts at 20°, and then remains liquid at ordinary temperatures.

**Valerylene,** a colorless, mobile liquid, homologous with acetylene, obtained by heating amylene bromide, with a concen-

trated alcoholic solution of potash, to 140° for several hours, washing the resulting product with water, distilling, and collecting the liquid which passes over between 44° and 46°. It has a pungent alliaceous odor, is insoluble in water, soluble in alcohol, boils at 46°, and has a vapor density of 2.356.

**Valetta,** a strongly fortified seaport and capital of Malta; on the N. E. coast of the island; on an elevated neck of land, with a large and commodious harbor on each side. The town has wide streets paved with lava, spacious squares, and fine quays, lined with elegant buildings. From the inequality of the site the communication between the different streets is maintained by flights of steps. The cathedral, built in 1580, contains the tombs of the Knights of Malta or of St. John, and in a chapel are the keys of Jerusalem, Acre, and Rhodes. Other notable buildings are the governor's residence, formerly the palace of the grand-masters; the library, museum, university, and the military hospital. The dockyard is capable of admitting the largest men-of-war. Some shipbuilding and various other industries are carried on, and the trade includes grain, wine, fruits, cotton, and other manufactures, coals, etc. The mail steamers for Alexandria, Constantinople, etc., call here, and it is the chief station of the British fleet in the Mediterranean. Pop. (1900) with suburbs, 61,268. See MALTA.

**Valette, Jean Parisot de La,** a French military officer; born in 1494. He came of a noble family of Toulouse, entered the order of the Knights of St. John, and was elected grand-master of that order in 1557. His life thenceforward is a series of exploits in warfare with the Turks, culminating in his famous defense of Malta, lasting from May 18, 1565 till Sept. 8. The Turks had 159 war ships and 30,000 men; the defenders were 8,500 men, with 700 knights, and unsupported held the fortifications heroically in spite of awful loss and privations, till the approach of a Neapolitan fleet caused the Turks to raise the siege. The veteran commander died Aug. 28, 1568. He built Valetta.

**Valhal, Valhalla,** or **Walhalla,** in Northern mythology, the chief hall in Asgard, the banqueting house of the Æsir, there entertained by Odin along with the Valr or Einherjar chosen by the Valkyrjur. Valhal has 540 doors, through each of which 800 Einherjar may pass abreast. In front is the grove Glasir, whose leaves are golden. W. of the door is a great wolf, and overhead a crouching eagle. Gleaming swords light up the hall. The roof trees are spears, the roof itself is formed of shields, and the seats are covered with shirts of mail. The Einherjar eats the flesh of the boar Sæhrîmnir, which is cooked every day, and at night is restored whole as before; and drink mead, which flows from the udder of the goat Heidrun. Every day the Einherjar, as soon as dressed, array themselves in armor, and go forth into the fields to fight and fell one another. This is their pastime; as it draws to breakfast time they ride back to Valhal, where they sit down to feast. After Odin's Valhal is named the Walhalla or Temple of Fame built by King Ludwig I. of Bayern at Donaustauf, near Regensburg.

**Valkyrjur** (more commonly, VALKYRIES), in Northern mythology, the beautiful "maids of Odin," goddesses of fate allied to the Norns. They numbered either nine or thrice nine, and in three bands went forth on horseback and clad in full armor, through air and water, over the wide world to choose for Odin the Valr or Einherjar ("single champions") worthy of Valhal. At home in Valhal the Valkyrjur were the cupbearers of the Æsir, and the Einherjar. The belief in the Valkyrjur toward the close of the heathen period may be seen in the Njalsaga's description of Daurrud's vision on the day of the battle of Clontarf. Twelve women came riding through the air and entered a hillside. Through an opening Daurrul saw them there weave a web of men's entrails, with a sword for batten and arrows for shuttles. They sang the while a song: "The web, the web of war is weaving for the fight: bloody shall be the fray; a king shall conquer: a mighty king and great chieftains shall be slain." Another moment, and the web was slit in two. With one-half six of the Valkyrjur hurried to the N. and vanished, while six sped to the S. with the other half. The incident has been finely told by the poet Gray in his ode, "The Fatal Sisters."

**Valla, Lorenzo della,** an Italian humanist; born presumably in Rome in 1407; studied Greek and Latin under the leading masters; and having failed to succeed to an uncle's post of apostolic secretary, took orders (1431), and accepted the chair of Latin eloquence at Pavia. About this time his "Elegance of the Latin Language" (Rome, 1471) established him as the supreme authority on Latin style; and having lectured successively at Milan, Genoa, and Florence, he received from Alfonso V. of Naples a private secretaryship along with the poet's crown (1437). The feud between Rome and Aragon made Alfonso glad to secure so fierce an opponent of the papal see as Valla, who in "The Forgery of the Donatians of Constantine" (1440) assailed Pope and cardinals, and demolished a lie imposed upon Christendom for centuries. The storm excited by this treatise drove Valla awhile to Barcelona, but returning to Naples he continued his assaults, impeaching the Vulgate's Latinity, the au-

thenticity of the Apostles' Creed, and of Christ's letter to Abgarus; and when cited before the Inquisition, declaring the Church knew nothing yet he believed with her. Pope Nicholas V., however, succeeding Eugenius in 1447, summoned Valla to Rome, and made him secretary; and he passed his remaining years in translating from the Greek, and in furious literary feuds with Poggio, Trapezuntios, and others among his compeers. He died in Naples, Aug. 1, 1457, leaving behind him Latin translations of Herodotus, Thucydides, and the "Iliad," "Notes on the New Testament," etc.

**Vallabhácharya,** a Hindu reformer of the 15th century, whose followers form a most influential sect in Western and Central India at the present day. He is regarded as an incarnation of Vishnu; and his descendants, under the title of Maharajah or Gosain, are still treated with semi-divine honors. His system inculcates the worship of Vishnu by his name of Krishna, in which form the god sported with the milkmaids; and it leads to self-indulgent and corrupt practices. A Puritan reaction within the sect was started by Swami-Narayan at the beginning of the 19th century. See "History of the Sect of Maharajahs or Vallabhácháryas in Western India" by Karsandas Mulji (Lond. 1865), and Monier Williams' "Hinduism" (1877).

**Valladolid,** a city of Spain, in Old Castile, capital of the province of the same name; on the left bank of the Pisuerga, and on the Irun-Madrid railway, 102 miles N. W. of Madrid. It is a fortress of the first rank and the seat of an archbishop; has a cathedral founded in 1585 by Philip II.; many monasteries; a celebrated university founded in 1346, an institute, an Academy of Fine Arts, a museum containing many beautiful pictures and sculptures, a library, various seminaries and industrial schools, a theater, hospitals, poorhouse, etc. Of its "plaze" the most beautiful are the quadrangular Plaza Mayor, the octagonal El Ochavo, and above all the triangular Campo Grande, where bull fights, autos-da-fé, and other public spectacles used to be held, and where Napoleon is said to have reviewed not fewer than 35,000 men. The manufactures of Valladolid, which have much revived, are chiefly of cloth, iron, and leather. The old Roman town of Pintia is said to have been rebuilt in 625 by the Goths, but the name Valladolid was first applied to it after its recovery from the Moors about 1072. From this time till Karl V. transferred the court to Madrid, Valladolid was a favorite residence of the Kings of Leon. It was the birthplace of Philip II. Pop. (1900) 68,789.

**Vallandigham, Clement Laird,** an American politician; born in New Lisbon, O., July 29, 1820; was a member of Congress in 1858–1863, and during the Civil War was a strong friend of the Southern Confederacy. He was arrested in May, 1863, by United States troops, on a charge of uttering disloyal sentiments; was tried by court martial; and sentenced to confinement till the end of the war. This was afterward commuted to banishment to the Confederate lines; but, as he was not very cordially received there, he went to Canada. In the same year he was nominated as candidate for governor of Ohio, and was beaten by the largest majority ever given in that State. He was a member of the Democratic National Convention in 1864, at which General McClellan was nominated for the presidency. He died in Lebanon, O., June 17, 1871.

**Vallaris,** in botany, a genus of *Parsonseæ;* twining Indian shrubs, with opposite leaves, dichotomous interpetiolar peduncles, salver-shaped corollas and follicular fruit.

**Vallauri, Tommaso,** an Italian Latinist; born in Chiusa di Cuneo, Italy, in 1805; in 1843 he became professor at Turin. He published editions of numerous Latin classics, including Plautus, Horace, Cicero, Sallust, Curtius, in whole or in part, besides dictionaries, epitomes, books on the literature of Piedmont, and an autobiography (1879). He died in Turin, Sept. 2, 1897.

**Vallejo** (väl-yā′hō), a city of Solano co., Cal.; on the N. E. shore of San Pablo Bay, at the mouth of Napa creek, and on the Southern Pacific railroad; opposite Mare Island navyyard, 27 miles N. N. E. of San Francisco. It has a large and safe harbor, accessible to the largest ships. Here are a high school, seminary for young ladies, a convent, Orphans' Home, banks, electric lights, waterworks, and several daily and weekly newspapers. The city has flour mills, shipyards, shoe factories, manufactories of steam engines, boilers, castings, sash, doors, and blinds, grain elevators, etc., and an assessed property valuation of nearly $3,000,000. Pop. (1890) 6,343; (1900) 7,965; (1910) 11,340.

**Vallentine, Benjamin Bennaton,** pen name FITZNOODLE, a New York dramatist and critic; born in London, England, Sept. 7, 1843; studied for the English bar; was one of the founders of "Puck," and its editor 1877–1884; dramatic critic of New York "Herald." He wrote: "The Fitznoodle Papers"; "Fitznoodle in America"; "The Lost Train"; "The Last Circle"; etc.; and the plays: "A Southern Romance"; "In Paradise"; "Fritz in New York"; "Madame Saccard" (adapted from Zola's "Renée"); a version of Daudet's "Sapho," etc.

**Valley,** in geology, a long depression or hollow on the surface of the earth, mar-

gained by ground more or less high. It may be on a vast scale of magnitude, as the bed of an ocean would be if upheaved sufficiently to become land, or it may be comparatively small but broad; or narrow, as a glen or a deep gorge, called by Americans a cañon or gulch. It may be surrounded by hills, or may constitute a depression crossing a country from sea to sea. Valleys of stratification are produced by the decay and removal of shale or other soft rocks, while the less destructible hard rocks remain. Other valleys have been excavated by rivers alone. Many valleys on low-lying plains adjacent to the sea have originally constituted river beds and banks, then through a depression of the land the ocean has gained access to them, constituting them estuaries; then again upheaval has made them land valleys. Other valleys have constituted the beds of old lakes. Valleys, resembling troughs, on table-lands are in many cases produced by the flexure of strata laterally, so as to constitute a series of elevations and depressions. A small number of valleys occurring high up mountain sides may constitute old craters.

**Valleyfield,** a city of Quebec, Canada, a port of entry, in Beauharnois co.; on the St. Lawrence river and Lake St. Francis, and on the Grand Trunk and New York Central railways; 30 miles S. W. of Montreal. Near by is the head of Beauharnois canal, constructed past the rapids of the St. Lawrence. The river here is crossed by a splendid railway bridge. Steamers ply daily to Montreal and other points E. and W. The city is well built, and possesses Salaberry, Gault, and Emard parks. The principal buildings are the court house, post office, the Roman Catholic cathedral, St. Thomas College, and the churches and convents. Besides St. Thomas College, the educational institutions include Gault Institute and the Convent of the Holy Name. There are Presbyterian, Anglican, and Methodist churches, and 2 newspapers. The leading industrial establishments are a cotton mill, employing over 3,000 hands, and manufactories of metal paints, flour, lumber, gasoline engines, foundry products, rope, sashes, doors, and blinds. The water works and electric lighting plants are owned and operated by the municipality. The assessed valuation of real property in 1906 was $3,643,950; the city's bonded debt was $583,045; the assets, $534,580. Pop. (1901) 11,055; est. (1907) 10,100.

**Valley Forge,** a village in Chester co., Pa., on the Schuylkill river, and on the Philadelphia and Reading railroad; 24 miles W. of Philadelphia. It is noted as the place where Washington with about 11,000 troops went into winter quarters in December, 1777. It was here also that Baron Steuben became inspector-general of the army, and the treaty of alliance with France was announced, May 6, 1778. During the winter the American army suffered greatly from cold and hunger, and about half of the men were unfit for active duty. In 1893 the Pennsylvania Legislature took steps to acquire and preserve Valley Forge as a public park and historic landmark. On Oct. 19, 1901, a monument was here unveiled by the Daughters of the Revolution in memory of the soldiers who died in camp during the winter of 1777–1778.

**Vallisneria,** in botany, the typical genus of *Vallisnereæ.* Fresh-water plants, with diœcious flowers. Males on a spadix, corolla monopetalous, with three segments. Females singly in a spathe, on a spiral peduncle; calyx monophyllous, corolla polypetalous, capsules one-celled, many-seeded, the seeds attached to a parietal placenta. Both sexes grow at the bottom of running water, and to effect fertilization the spiral peduncle of the female flower elevates it to the surface of the stream as the male flowers are floating past. There are two species, one, *V. spiralis,* found in various warm or hot countries, including the S. of Europe; the other Australian. The leaves of the first are beautiful objects for the microscope, as they exhibit the movements of the fluids within. *V. alternifolia* (Roxburgh), a sub-species of *V. spiralis,* is one of the plants used in India mechanically to supply water to sugar when it is being refined.

**Vallombrosa,** formerly an abbey in a wooded valley of the Apennines, belonging to the diocese of Fiesole, in the Florentine territory, where Giovanni Gualberto founded a house for monks in 1038, subject to the rule of St. Benedict. The building (dating from 1637) now accommodates an institute of forestry.

**Valmy,** a village of France, in the department of Marne; celebrated for the affair known as the cannonade of Valmy; where the French republican troops under Kellermann defeated the Prussians in 1792.

**Valois** (vä-lwä'), **House of,** a dynasty which ruled France from 1328 to 1589. In 1285 Philip III. gave the county of Valois (now in the departments of Oise and Aisne) to his younger son Charles, and on the extinction of the Capet dynasty in 1328 the eldest son of this Charles of Valois ascended the French throne as Philip VI., and founded the Valois dynasty, which was followed by the house of Bourbon.

**Valonia,** in botany, a genus of *Hydrogastridæ* (Lindley), the typical genus of *Valoniaceæ* (Berkeley). It forms irregular masses of large cells, or repeatedly constricted sacs, which might be mistaken for the eggs of a mollusk.

**Valparaiso,** a city and county-seat of Porter co., Ind.; on the Pennsylvania, the New York, Chicago, and St. Louis, and the Chicago and Grand Trunk railroads; 44 miles E. of Chicago. It is in an agricultural section. Here are the Northern Indiana Normal School, several National and State banks, and a number of daily and weekly newspapers. The city has self-winding clock factories, machine shops, and an iron foundry, and an assessed property valuation of nearly $2,500,000. Pop. (1890) 5,090; (1900) 6,280.

**Valparaiso** ("the vale of Paradise"), the chief seaport of Chile; in a province of the same name; 90 miles W. N. W. of Santiago, the capital, with which it is connected by railway. It is built at the base of steep, bare hills about 1,600 feet high, and round the head of a bay which possesses good anchorage, but is exposed to N. winds, and therefore unsafe in winter. The streets are narrow and often steep, but are well paved, and some of them are traversed by tramways. The houses are substantial, and often elegantly decorated. The public buildings include a number of important educational and charitable institutions, besides churches and theaters. The city has been greatly damaged by earthquakes on various occasions (notably in 1822, 1829, and 1851), as well as by a bombardment by a Spanish fleet on March 31, 1866. The climate is good, but dry, little rain falling except during the three winter months. The annual mean temperature is 58°. The chief items of import are copper and copper ore, gold, silver, cereals, wool, hides, and tallow. Pop. prov. (1907) 281,872; city (1907) 180,600.

**Valpy, Abraham John,** an English publisher; born in Reading, England, presumably about 1787; was educated at the University of Oxford. About 1808 he became a bookseller and publisher in London. In 1810 he founded "The Classical Journal" and in 1822–1825 published "The Museum." He brought out a number of noteworthy publications, including Barker's edition of Stephen's "Thesauraus" (8 vols., 1815–1825); "The Family Classical Library," a series of English translations, etc. (52 vols. 1830–1834); the "Variorum" edition of "Latin Classics" (141 vols. 1819–1830); several of the works of his brother, Frederick, and of his uncle, Edward; etc. He died in London, England, Nov. 19, 1854.

**Valtelline,** the rich and fertile valley of the Upper Adda down to its influx into the Lake of Como. In a wider sense the term covers the whole of that part of Lombardy which includes this valley, as well as Chiavenna and Bormio, corresponding to the modern province of Sondrio. The 120,000 inhabitants speak a dialect of Italian akin to the Romansch. In the 16th century the district became subject to the Swiss canton of Grisons; the latter, however, steadily resisted the efforts of the Valtellines to secure citizenship, which resulted in the bloody Valtelline war (1620). The Grisons was victorious, and governed the Valtelline more oppressively than ever, till at the petition of the inhabitants Napoleon incorporated the country with the Cisalpine republic, and the Valtelline has since shared the fortunes of Lombardy and Italy.

**Valuation,** the process of fixing the price or rent to be paid for a piece of property. Surveyors and valuers are often called on to advise persons who propose to become purchasers, lessees, or mortgagees of real estate; trustees are, generally speaking, bound to take a professional opinion before advancing trust moneys on the security of land, etc. When property is required as a qualification for a franchise or office the law prescribes the rules for ascertaining the value. Again, property must be valued in order to determine the taxation to which it is subject; thus the whole property of a deceased person is valued for probate and succession duty. Domesday book contains a valuation for feudal purposes of the lands of England, except the four N. counties. When revenue was raised by means of subsidies the burden was distributed "according to the faculties of men"—*i. e.*, according to ability to pay: land, offices, and personal property were all valued for taxation. In 1692 a new valuation was made for land tax, and lands continued to be assessed as in that year till the act of 1798 by which the old land tax was rendered permanent, and means were provided for its gradual redemption. The true land tax of the present day is the landlord's property tax collected under schedule A of the Income-tax Act.

The valuation of lands in Scotland seems first to have been made in the 13th century. Next century a new valuation was made by authority of Parliament; and as prosperity increased this new extent, as it was called, came to be much above old extent, and the new was often fixed by adding a certain proportion to the old extent. Under Cromwell and after the Restoration the total sum to be raised by taxation was first fixed, and then distributed among the counties, commissioners having the power to alter the old valuation. The valued rent thus arrived at was the basis of the land tax till 1854, when the commissioners of supply in counties and the magistrates in burghs were directed to make a valuation roll annually showing the value of all lands and heritages within the county or burgh, according to which roll all local assessments were to be made, and assessors were to be appointed to carry out the act. By the Local Government Act,

Scotland, 1889, the powers of the commissioners of supply were transferred to the county councils. See SINGLE TAX.

**Value,** in music, the relative length or duration of a tone or note; as, A semibreve is of the value of two minims, or four crotchets, or eight quavers, etc. In political economy, the value of any economic quantity is any other economic quantity for which it can be exchanged. Worth as estimated by the power of purchasing or being exchanged for other commodities; the command which the possession of a thing gives over purchasable commodities in general. Value differs from price, in that the latter always expresses the value of a thing in relation to money.

**Valvata,** in zoölogy, valve shell; a genus of *Paludinidæ,* with 18 recent species, from Great Britain and North America. Shell turbinated or discoidal, umbilicated; operculum horny, multispiral. Animal with a produced muzzle; tentacles long and slender, eyes at their outer bases; lingual teeth broad. There are 19 fossil species, from the Wealden onward.

**Valve,** a kind of movable lid or cover adapted to the orifice of some tube or passage, and so formed as to open communication in one direction and to close it in the other, used to regulate the admission or escape of a fluid, such as water, gas, or steam. Some valves are self-acting, that is, they are so contrived as to open in the required direction by the pressure of the fluid on their surface, and immediately to shut and prevent the return of the fluid when the direction of its pressure changes. Others are actuated by independent external agency. Examples of the former kind are presented in the valves of pumps, and in the safety valves of steam boilers, and of the latter in the slide-valves appended to the cylinder of a steam engine for the purpose of regulating the admission and escape of the steam. The construction of valves admits of an almost endless variety.

**Valylene,** in chemistry, a liquid possessing an alliaceous odor, prepared from isovalerylene dibromide by boiling with alcoholic potash. It is insoluble in water, slightly soluble in alcohol, boils at 50°, and gives a yellow precipitate with an ammoniacal solution of copper.

**Vambéry, Arminius,** or **Hermann,** a Hungarian traveler and Orientalist; born in Szerdahely, Hungary, March 19, 1832. Escaping from the tailor's bench to which his family would have condemned him, he succeeded amid much privation and hardship in laying the foundations of wide linguistic scholarship, first under the Piarists of St. Georgen near Pressburg, and afterward at Vienna and Pest. Expelled from Pest by the Austrian authorities for his connection with the Revolution of 1848, the young teacher of languages removed to Constantinople (1854), and there maintaining himself as French tutor to Afif Bey and Rifaat Pasha, made a thorough study of Arabic, Turkish, and Persian. In 1863, under the auspices of the Academy at Pest, he successfully accomplished a most adventurous journey in Turkestan, passing in safety, under the disguise of a dervish and the pseudonym of Reshad Effendi, through the fanatical Mohammedan cities of Khiva, Bokhara, and Samarcand. He became Professor of Oriental Languages and Literature in the University of Pest, in 1865; and was universally known not only as a master of Eastern lore, but as one of the keenest observers of Eastern politics. A strong believer in the regenerative power of Western civilization, he was almost as strongly a partisan of English as opposed to Russian influence. Besides the narrative of his great journey, which appeared in German, English, and Hungarian, in 1865, he published "German-Turkish Dictionary" (1858); "Abuschka: Turkish-Hungarian Dictionary" (1861); "A Study of the Turkish Language" (1867); "Sketches in Central Asia" (1867); "Travels and Experiences in Persia" (1868); "History of Bokhara" (1872; 1873); "Central Asian and Anglo-Russian Frontier Question" (Lond. 1874); "Islam in the Nineteenth Century" (Leip. 1875); "Ethics of the East" (Berl. 1876); "Etymological Dictionary of the Turco-Tartar Tongue" (Leip. 1877). He was a frequent contributor to periodical literature in England, Germany, and Hungary.

**Vambrace,** the portion of armor which covered the arm from the elbow to the wrist. It originally protected only the outside of the forearm, being buckled to the sleeve of the hauberk, or fastened to the hinges on the rings of mail; afterward it was a complete tube, with hinges to encircle the arm.

**Vampire,** the subject of one of the most gruesome superstitions in the world; that of the dead leaving their graves to destroy and prey on the living. It is characteristically Slavonic, though by no means exclusively so, and it is strongest of all in White Russia and the Ukraine. It still dominates the popular imagination in Russia, Poland, Servia, among the Czechs of Bohemia, and the Slovaks of Hungary, and also in a less degree in Albania and Greece. The modern Greek term for a vampire is identified by Bernhard Schmidt with the Slavonic name of the werewolf (Bohemian, *vlkodlak;* in Bulgarian and Slovak, *vrkolak*), the regular name for a vampire in Servia being *vukodlak.* The Russian *vampir* (South Russian, *upuir,* anciently *upir;* Polish *upior*) in his earthly life was a wizard, a

witch, a werewolf, a suicide, or one cursed by his parents or the Church. Even an innocent man may involuntarily become a vampire by himself falling a victim to one, or merely by a cat or a bird accidentally crossing his corpse before its burial.

A survival of this notion is found in Henderson's account of how the Northumbrians at once put such a cat to death. Such bodies do not decay in the kindly earth, for when a vampire's grave is opened no trace of death is seen on the corpse; he lies turned in his grave, with fresh cheeks, open staring eyes, the skin, hair, and nails still growing. During the night he rises from his grave and sucks the blood of sleepers, who pine and die while he draws his nourishment from their life. He can only be laid to rest by a stake (in Russia of aspen) being driven through his body at a blow — a custom only abolished in the case of suicides in England by an act of George IV. Sometimes when he first awakes in the grave to his unhallowed shadowy life he begins to gnaw his own hands and feet, or to chew his shroud, causing his kindred to pine away and die. In many cases such witches only devour the hearts of their victims, or steal them out of their bodies, substituting for them the heart of a cock or a hare, and so destroying the nature. The stolen heart they expose over a magic fire in order to create hopeless love-longings in the breast from which it was taken — an idea which Jakob Grimm says lies at the foundation of our metaphorical phrases within the vocabulary of love of "giving" or "stealing one's heart."

Such a notion of a nocturnal demon eating out the souls or hearts and sucking the blood of men gives to the primitive mind a natural and rational explanation of such phenomena as a patient seen becoming from day to day, without apparent cause, thin, weak, and bloodless. It is found widely prevalent in popular folklore, and imbedded in the doctrine of folk-medicine, sorcery, and witchcraft everywhere, and Doctor Tylor refers it directly to the principles of savage animism. We need not linger over Afanasief's mythological interpretation of how the sucking of the sleeper's blood symbolizes the drawing of rain from the clouds by the thunder god and the spirits of the storm at the close of the deathlike sleep of winter. The likeness to the corpse-eating ghouls of Oriental folklore and the *alûkah* of Proverbs xxx: 15 is apparent, and scarcely less the points of contact with the still more widely-spread superstition of the werewolf. Teutonic mythology has parallels enough of animated corpses returning to satisfy a thirst for blood or their carnal appetites, and it is a commonplace of popular folklore that it is fatal to meet a *revenant* of any nature. Hertz notes that little is known of regular "corpse specters" among races which burn their dead, and Hanusch maintained that therefore the ancient Slavonians who burned the dead must have borrowed the vampire superstition from such other race. But, as Ralston points out, it is not certain that burial by cremation was universally practised by the heathen Slavonians, Kotlyarevsky's conclusion being that there never was any general rule, some burying without burning, others burning first and then burying the ashes.

**Vampire Bat,** a name formerly given to *Vampyrus spectrum*. Also any species of the group Desmodontes, consisting of two genera, each represented by a single species. They differ from all other bats in the character of dentition, the upper incisors being very large, trenchant, and occupying the whole space between the canines; premolars very narrow, with sharp-edged longitudinal crowns; molars rudimentary or none; œsophagus very narrow; cardiac extremity of stomach greatly elongated, forming a long, narrow cæcum. The species are sanguivorous, and cling by their extremities to the body of the animal whose blood they may be sucking.

VAMPIRE BAT.

**Vampyrus,** in zoölogy, the type genus of the group *Vampyri*, with two species, from the Neotropical region. There are two species: *V. spectrum*, about eight inches long, commonly called the vampire bat, and erroneously said to be sanguivorous, the observations of modern travelers having shown that it feeds on fruit and insects; and *V. auritus*, a somewhat smaller bat.

**Van,** a walled town of Turkey in Asia; the capital once of an Armenian kingdom, near the S. E. shore of Lake Van; 145 miles S. E. of Erzerum; pop. 30,000.

**Van, Lake,** a salt-water lake in Asiatic Turkey; 5,467 feet above sea-level; area about 1,600 square miles; it contains many islands and has no visible outlet.

**Vanadium,** in chemistry, a metallic pentad element, discovered by Sefström in 1830, in the refinery slag of the iron ores of Taberg, in Sweden; symbol, V; at. wt. 51.2. It is extracted from the finely-pulverized slag by deflagrating with niter and sodic carbonate, digesting the fused mass

with a saturated solution of sal-ammoniac, and igniting the product in an open vessel. On heating the mass with potassium, and washing with water, pure vanadium is obtained as a brilliant metallic powder, having a silver-white luster. It is nonvolatile, does not tarnish in the air, burns vividly when heated in oxygen, is insoluble in hydrochloric acid, dissolves slowly in hydrofluoric acid, but very rapidly in nitric acid, forming a blue solution. It forms five oxides, analogous to the oxides of nitrogen, and three chlorides, viz., the dichloride, the trichloride, and the tetrachloride

**Van Amringe, John Howard,** an American educator; was graduated at Columbia College (now University) in 1860; was tutor of mathematics there in 1860-1863; adjunct professor in 1863-1873; then full professor. He became dean of the School of Arts in 1894, and of the university in 1896; was acting president when President Seth Low was a delegate to The Hague Conference in 1899, and again from the resignation of President Low, to accept the mayoralty nomination, till the election of Dr. Nicholas Murray Butler, 1901-1902; and retired in 1910. He was author of many works relating to the university.

**Van Benschoten, James Cooke,** an American educator; born in La Grange, N. Y., Dec. 15, 1827; was graduated at Colgate University in 1856; was principal of Oxford Collegiate Institute in 1857–1858; took special studies at the Universities of Berlin, Bonn, Göttingen and Athens in 1858–1861. Returning to the United States he was made Professor of Greek at Wesleyan University, and, though he was offered similar chairs in other universities, remained with Wesleyan till his death, Jan. 18, 1902. He was director of the American School of Archæology in Athens in 1884 and 1885 and while in Greece secured from the Greek government the land on which is built the edifice of that institution. He died Jan. 17, 1902.

**Vanbrugh** (van-brö′), **Sir John,** an English architect and dramatist; born about 1666; educated partly in England and partly in France. He entered the army, became well known in London as a man of fashion, and then turned his attention to play writing. His first play, "The Relapse," was brought out at Drury Lane about 1697, and was followed by "The Provoked Wife," and "Æsop." The first two of these had all the wit and most of the freedom of treatment which characterized that period, but "Æsop" was moral and dull, and therefore unsuccessful. How he obtained his knowledge of architecture is not known, but at this time (1702) Vanbrugh designed Castle Howard, the seat of the Earl of Carlisle. Afterward he entered with Congreve into a speculation to build a great theater at the W. end of London, in which he was his own architect; but it did not prove a success. In 1706 he was commissioned by Queen Anne to present the garter to the Elector of Hanover, and the same year he was occupied with the erection of Blenheim Palace. This work got him into considerable pecuniary trouble, as Parliament, which voted it, voted nothing for its payment. He built many other mansions for the nobility; in 1714 he was knighted by George I.; in the following year appointed controller of the royal works, and in 1716 surveyor of Greenwich Hospital. Vanbrugh's plays are admirable in dramatic conception as well as in wit, and his architectural works received the approval of Sir Joshua Reynolds. He died in London, March 26, 1726.

**Van Brunt, Henry,** an American architect; born in Boston, Mass., Sept. 5, 1832; was graduated at Harvard College in 1854. During the Civil War he served for two years on the staff of the commander of the North Atlantic squadron. After practising his profession in Boston for about 20 years he settled in Kansas City in 1887. He was the architect of many buildings conected with Harvard University and of numerous public edifices in different parts of the United States, including churches, libraries, railroad buildings, etc. He designed the Electricity Building for the World's Columbian Exposition. He was elected president of the American Institute of Architecture in 1898. His publications include "Greek Lines and Other Architectural Essays" (1893); "Discourses on Architecture"; and many technical papers. He died April 8, 1903.

**Van Buren, Martin,** an American statesman; 8th President of the United States; born in Kinderhook, N. Y., Dec. 5, 1782. He became office boy to the village lawyer, studied hard, and was called to the bar in 1803. Long before this, however, he had developed a precocious interest in politics, and at the age of 18 was already member of a nominating convention. In 1812 and 1816 he was elected to the State Senate, and in 1815–1819 he was State attorney-general. In 1821 he entered the United States Senate, of which he was a member till his election in 1828 to the governorship of New York. In the same year he zealously supported Jackson for the presidency, and in 1829 he was rewarded with the portfolio of Secretary of State. This he resigned in 1831. Two years later he was elected Vice-President, and in 1835 President, but by a popular majority of less than 25,000, and that largely owing to his declared opposition to the "slightest

interference" with slavery. Van Buren's four years of office were darkened by the gloom of financial panic; but what one man could he did to lighten it, by wringing from Congress its assent to a measure for a treasury independent of private banks. This and his firm adherence to obligations of neutrality during the Canadian rebellion of 1837 are his most statesmanlike acts, but both cost him popularity and votes; in 1840 he and his party were overwhelmingly defeated by the Whigs. He lost the nomination in 1844, because he opposed the annexation of Texas; and his nomination by the Free Soil party in 1848 only secured the return of the Whig candidate and the rejection of both Democrats. This was his last important appearance. Van Buren was a master of the politician's arts, but he used his great skill for what he counted the highest ends. He loved not to follow but rather to make public opinion and a party for himself; for he had on the whole a statesman's soul and not a place-hunter's. So we see him often doggedly ranging himself on the unpopular side — favoring negro suffrage, and opposing an elective judiciary. He was intensely partisan, trained a Jefferson Democrat, and loyal to his early teaching; yet his political antipathies did not destroy his warm private friendship for great opponents such as Henry Clay. He died in Kinderhook, July 24, 1862.

**Vance, Zebulon Baird,** an American lawyer; born in Buncombe co., N. C., May 13, 1830. He was educated at Washington College, Tenn., and at the University of North Carolina, and was admitted to the bar in 1852. He was member of Congress from North Carolina in 1858-1861; colonel in the Confederate army in the Civil War; governor of North Carolina in 1862-1865, and 1877-1879; and United States Senator from 1879 till his death in Washington, D. C., April 14, 1894.

**Vancouver,** a city of British Columbia, Canada; situated on Burrard inlet, an arm of the Gulf of Georgia, and on the Canadian Pacific railway and the Vancouver, Westminster, and Yukon railway (a subsidiary line of the Great Northern), of both of which lines Vancouver is the Pacific terminus. The S. portion of the city is intersected by False creek, another arm of the Gulf of Georgia, and the greater part of the city is on a peninsula between these two. As a spine of high ground runs along the center of this peninsula, the ground slopes each way to the water, forming a natural site for good drainage—a great advantage, as during the winter months the rainfall is considerable. The city's area is 10,000 acres. Vancouver has a deep, spacious, and sheltered harbor, a very extensive system of water transportation, and steamship connections with many distant parts of the world. Lines run to all points on the British Columbia coast, on Puget Sound, and to San Francisco as well as to Glasgow, Liverpool, London, the Hawaiian and Fiji islands, Australia, New Zealand, China, and Japan. The leading business streets are Hastings, Granville, Cordova, Water, and Westminster avenue; the principal residential streets are Robson, Denman, Davie, Nichols, Jervis, and Barclay.

*Buildings, Parks, and Institutions.*—The most prominent buildings are the stone court house (a new court house was in course of construction in 1907), city hall, Carnegie Library, Montreal Bank, Bank of Commerce, the Flack block, the Kelly-Douglas block, Masonic hall, post office, Dominion assay office, and custom house. There are several fine parks, of which the best is Stanley park, a piece of the primeval forest of the Pacific coast, containing trees up to sixteen feet in diameter and from 100 to 250 feet high. It has an area of about nine square miles, is intersected by good roads, and is jealously preserved in its unique beauty by the citizens. Adjoining it is Brockton Point, a park for races and games. In Recreation park baseball games are held.

Vancouver has fifty churches, of which the finest are the Church of the Holy Rosary (R. C.), St. John's (Pres.) and Wesley (Meth.) churches. The educational institutions include University College of British Columbia, affiliated with McGill University, Montreal; the normal school, a high school, and thirteen public schools. The charitable institutions are the city hospital, isolation hospital, St. Paul's Hospital (R. C.), St. Luke's Home, and several orphanages. The leading clubs are the Vancouver, Terminal, and Western. There are also an opera house and the People's theater. The principal hotels are the Vancouver, Dominion, Commercial, Metropole, Burrard, Badminton, and Leland. The three leading daily newspapers are the "Province," the "World," and the "News-Advertiser."

*Industry, Commerce, etc.*—The surrounding district is rich in fruit, grain, hay, and garden produce, and the thick, high forest contains the Douglas fir, cedar, white pine, and other coniferous trees. The principal industries are lumbering (whose product has not only a Canadian market, but is shipped to the United States, Europe, and Asia) and salmon, halibut, and herring fishing. Other industries are the mining of gold, silver, lead, coal, copper, and the manufacture of canned goods, beer, whisky, jute, carriages and wagons, iron goods, machinery, glass, soap, etc. The output of manufactures in 1901 was valued at $5,000,000. According to the customs returns for the year ending March 31, 1906, the city's exports amounted in value to $7,408,113; imports, $7,454,421. The water supply,

which is owned and operated by the city, is drawn by gravitation from Capilano creek in the mountains to the N. of the city. The government is composed of a mayor and council of twelve aldermen. The assessed value of taxable property in 1906 was $53,000,000. There was in 1907 a total street mileage of 193 miles, and of this 70 miles were improved. In 1906 the electric street railway carried 9,064,891 passengers. The growth of population has been phenomenal for so young a city. Vancouver, although its site had a few settlers before 1885, when it was selected by the Canadian Pacific railway as its western terminus, practically dates only from that year. In 1886, when the population numbered a little over 600, the town was destroyed by fire, which virtually swept it out of existence, but the settlers remained undaunted. Many of the inhabitants are Chinese. Pop. (1887) 2,000; (1888) 6,000; (1891) 13,685; (1901) 26,133; (1909) 110,068.

**Vancouver, George,** an English navigator; born about 1758. He entered the navy as midshipman in 1771; accompanied Cook on his second and third voyage (1772–1774 and 1776–1779); was made 1st lieutenant in 1780; and served in the West Indies till 1789. In 1790 he was put in command of a small squadron sent to take over Nootka from the Spaniards, and was also charged to ascertain if there was a N. W. passage. He sailed in the "Discovery," April 1, 1791, spent some time at the Cape, and afterward made for Australia and New Zealand, the coast of which he surveyed. He then went N. and received formal surrender of Nootka, and spent the three summers of 1792–1794 in surveying the coast as far N. as Cook's Inlet, wintering at the Sandwich Islands. On his return voyage he visited the chief Spanish settlements on the W. coast of South America, and reached England in 1795, where a narrative of his voyage was published in 1798. Vancouver Island was named after him. He died near London, May 10, 1798.

**Vancouver Island,** an island belonging to British Columbia; in lat. 48° 19′–50° 53′ N. and lon. 123° 17′–128° 28′ W.; is separated from the mainland by Queen Charlotte Sound, Johnstone Strait, and Strait of Georgia, which taken together form an open sea way. The island is 278 miles in length, and from 50 to 65 miles in breadth; area, 15,937 square miles; pop. 50,154. Its outline is boldly picturesque. The shores are marked by abrupt rocky cliffs and promontories, by pebbly beaches and sheltered coves, with fine harbors. The W. shores are gloomy and frowning in aspect, deeply indented by fiord-like arms of the sea, the banks of which are formed by steep rocks rising like walls. The whole country is more or less densely wooded, except where the mountain summits afford no foothold for plants, or where open grass lands occur. There are no navigable rivers, and the streams, which are torrents in winter, and are nearly dry in summer, are short, and are valuable only as supplying power for mills. The climate resembles that of Southern Britain; the warm Pacific Gulf Stream striking the coast preserves a mild and agreeable temperature; and in the S. E., where there is much less rain than in the N. or on the mainland, snow seldom falls. Only a small proportion of the surface is suited for agriculture — perhaps a million acres. Fruit culture is profitably carried on. The island is very rich in minerals. Besides gold, silver, copper, iron, etc., it possesses great fields of excellent coal, at Nanaimo in particular. Another source of wealth is in the fisheries; good banks lie off the coast, and fish and fish products to the value of $1,200,000 annually are exported from VICTORIA (*q. v.*), the capital.

The island was discovered in 1592 by Juan de Fuca, and visited in 1792 by Capt. George Vancouver (1758–1798), an officer in the British navy; but the first permanent settlement was not made till 1843 when the Hudson Bay Company built a fort and trading post where Victoria now stands. See BRITISH COLUMBIA.

**Vandal,** one of a Slavonic or Teutonic tribe who inhabited the banks of the Oder, and the sea coasts of Pomerania and Mecklenburg, about A. D. 250. At the beginning of the 5th century they traversed the Rhine, the Rhone, and the Pyrenees, and founded a powerful kingdom in Spain. They afterward passed into Africa under their king, Genseric, 429, and after a career of conquest on that continent, during which they had embraced Christianity, Carthage fell under their victorious arms, Oct. 9, 439. Here they commenced the formation of a powerful navy, and fitted out an expedition against Rome, which they sacked, June 15–29, 455. Having embraced the Arian heresy in 530, they carried on a cruel persecution against the members of the orthodox faith. Their rule in Africa was destroyed by Belisarius, and the entire nation had disappeared from that continent by 558. Hence, a person ignorant and barbarous, and hostile to the progress of the arts and literature.

**Vandamme, Dominique Joseph** (*vong*-däm′), a French military officer; born in Cassel, Nord, France, Nov. 5. 1771. During the revolutionary war he was distinguished as commander of the Chasseurs de Mont-Cassel; in 1799 was a general of division; fought at Austerlitz; reduced Silesia in 1806 and 1807, and repeatedly commanded an army corps; but was defeated and taken

prisoner at Kulm in 1813. He held a command during the Hundred Days, and after the second restoration was exiled, but returned from the United States in 1824 to die in Cassel, May 15, 1830.

**Vanderbilt, Cornelius,** an American capitalist; born near Stapleton, Staten Island, N. Y., May 27, 1794; early engaged in steamboat transportation between Staten Island and New York and so enlarged his business that he soon gained the complete control of the New York and Staten Island lines. Later he started steamboats in various waters — the Hudson, the Delaware, Long Island Sound, etc.; established steamboat and other connections between New York and California; and by 1864 was the owner or controller of nearly the whole water transportation in and about New York. In that year, however, he withdrew his capital from shipping and invested it in railroads. He secured the management of one railroad after another and in 1877 controlled stocks representing an aggregate capital of $150,000,000, of which he owned fully one-half. In 1861 he presented the swift $800,000 steamship "Vanderbilt" to the United States government to be used for the capture of Confederate privateers and in 1872 founded the Vanderbilt University in Nashville, Tenn., with $500,000, afterward increased to $700,000. At the time of his death in New York city, Jan. 4, 1877, his fortune was estimated at nearly $100,000,000.

**Vanderbilt, Cornelius,** an American capitalist; born in New York, Staten Island, N. Y., Nov. 27, 1843; a son of William Henry; was assistant treasurer of the Harlem railroad in 1865–1867; treasurer in 1867–1877; first vice-president of the New York Central railroad in 1877–1885; and chief director of the Vanderbilt system of railroads in 1885–1895, when he retired from business because of failing health. He united with his brothers in a gift of $250,000 for the erection of the Vanderbilt Clinic of the College of Physicians and Surgeons in 1896; presented an addition costing $250,000 to St. Bartholomew's Home in New York city; gave Rosa Bonheur's painting, "The Horse Fair," to the Metropolitan Museum of Art; and was the donor of $100,000 to the fund of the Protestant Episcopal Cathedral of St. John the Divine, "Vanderbilt Hall" to Yale University, and large sums of money to various charitable, religious, and public institutions. He died in New York city, Sept. 12, 1899.

**Vanderbilt, Cornelius,** an American inventor; born in New York city; a son of the second Cornelius; was graduated at Yale University in 1895; entered the shops of the New York Central railroad; invented several important pieces of railroad machinery, including a corrugated furnace to be used in place of the ordinary locomotive fire box; lectured at the Sheffield Scientific School of Yale University; and was appointed as a member of the New York Civil Service Board in 1901.

**Vanderbilt, William Henry,** an American capitalist; born in New Brunswick, N. J., May 8, 1821; son of the first Cornelius; was appointed vice-president of the Hudson River railroad in 1864 and later of the New York Central railroad; and on the death of his father became president of these railroads, together with the Lake Shore and the Michigan Central. Subsequently he secured control of the Chicago and Northwestern and of the Cleveland, Columbus, Cincinnati and Indianapolis railroads and also obtained connections with the New York, Chicago and St. Louis and West Shore railroads. He resigned his various offices, because of failing health, in 1883 and placed his affairs in charge of his son Cornelius. Among his public benefactions were the removal of the obelisk from Egypt to Central Park, New York city, and the gift of $200,000 to the Vanderbilt University fund. He died in New York city, Dec. 8, 1885.

**Vanderbilt University,** an American educational institution in Nashville, Tenn., chartered under the auspices of the Methodist Episcopal Church, South, as Central University in 1872; endowed by Cornelius Vanderbilt and name changed as at present in 1873; opened in 1875; has endowment, $1,600,000; grounds and buildings, $1,250,000; average faculty, 125; average students, 970; volumes in library, 40,000; graduates, over 4,500.

**Vandergrift,** a borough in Pennsylvania, pop. (1902) est. 7,000; known as a workingman's paradise. It is located 38 miles E. of Pittsburg on the West Penn. railroad, in the Kiskiminetas valley. Here a tract of ground was purchased by the Apollo Iron and Steel Company, now the American Sheet Steel Company, whose operations at Apollo, a short distance farther up the river, had outgrown the space available for their works. Ground was broken for the new town in June, 1895, and simultaneously the construction of the new plant began. The first sheets rolled here were turned out on Oct. 29, only four months after. The plant then consisted of 13 mills, but the business of the company speedily outgrew the capacity of the original works and 16 more mills were soon added, making 29. Nearly all the steel for these mills is produced in open hearth furnaces, which form part of the local plant. The annual output of finished product, which is increasing with the erection of new mills, has been 130,000

gross tons of sheet bars, 105,000 net tons of black sheets, and 170,000 net tons of galvanized sheets. The large output of galvanized sheets is due to the fact that all sheets intended to be galvanized are brought to the Vandergrift plant from the other works of the American Sheet Steel Company in the Kiskiminetas valley, located at Apollo, Leechburg, Saltsburg, and Hyde Park.

When the managers of the Apollo Iron and Steel Company decided to build the new plant they also decided to lay out a town which would be so superior to the ordinary industrial settlement that it would attract a high class of workingmen. The financial benefits to accrue from the sale of lots were not overlooked, but this phase of the undertaking was made subordinate instead of paramount. The site selected was ideal. The mills were laid out on a comparatively level part of the tract. The ground set apart for the town slopes up gradually from the Kiskiminetas river, affording perfect conditions for drainage. The services of Frederick Law Olmsted, the famous landscape gardener, were secured in making the plan of the town.

When all the preparations had been made, the men who expected to be employed in the mills were given the first opportunity to purchase lots. They had this preference for an entire week. The price made was the average price realized for five years for lots of the same size in the neighboring town of Apollo. No restriction was imposed on the purchasers save with regard to the sale of liquor. No liquor is permitted to be sold in the town. The lots were sold with no stipulation as to building lines or the character of the house to be built. Every man was permitted to be guided by his own taste. The company erected no houses and have none for rent, established no store and engaged in no branch of business outside of the manufacture of sheets, except such as were absolutely necessary in founding a new town. They organized a land company to look afte real estate matters, as well as gas, water and electric light companies, but embarked in no line which brought them into competition with private enterprise. Further, no official manager, superintendent or foreman can be interested in any business dependent to any extent upon the patronage of workmen. As soon as the workingmen purchased lots they consulted with their neighbors and established building lines or decided on uniform terraces in front of their houses where such were desirable. Instead of erecting plain or homely structures, they were inspired by their surroundings to study architectural graces, and numerous beautiful houses were built in the very infancy of the town. Every street is a revelation to one familiar with other workingmen's towns.

The natural advantages which are to be found in the locality add much to the charm of living in Vandergrift, which the workingmen themselves have named "a workingman's paradise." It is in a natural gas district, and every house uses this convenient fuel for cooking and heating, and sometimes for lighting, though electric light is generally used. Thus much of the labor and dirt incident to housekeeping are avoided. It is, further, only 3 miles from springs which have long been famous for the purity of their water. From these springs the supply of water is piped to the town. So excellent is the quality of this water that not a single case of typhoid fever has originated in the town from the date of its settlement. Coal is mined abundantly within a few miles and can be had cheaply for any purpose for which it may be required.

The citizens govern the town, which has been incorporated as a borough under the laws of Pennsylvania. The officers thus elected by them have charge of the schools, look after the peace and good order of the community, and supervise all public improvements. They have erected good schoolhouses, raising money for that purpose by issuing bonds, the land company donating the ground. The company also donated ground for four churches when the town was started, stipulating that each should cost not less than $15,000, of which they further paid one-half. Since then several churches have been built.

**Van der Poorten-Schwartz, J. M. W.** See MAARTENS, MAARTEN.

**Van Devanter, Willis,** an American jurist; born in Marion, Ind., April 17, 1859; received a university education; practiced at Marion in 1881-1884, and at Cheyenne, Wyo., from 1884; appointed a commissioner to revise the "Statutes" of Wyoming in 1886; member Territorial Legislature in 1888; chief justice of the Supreme Court of Wyoming in 1889-1890; Assistant Attorney-General of the United States in 1897-1903; United States Circuit Judge, 8th Judicial Circuit, in 1903-1910; Professor of Equity Pleading, Jurisdiction, and Practice in George Washington University in 1898-1903; became an Associate Justice of the Supreme Court of the United States in 1910.

**Van Dieman's Land.** See TASMANIA.

**Van Dieman.** See DIEMEN, ANTON VAN.

**Van Dorn, Earl,** an American military officer; born near Port Gibson, Miss., Sept. 17, 1820; was graduated at the United States Military Academy in 1842; became a captain in 1855, and resigned his commission on the outbreak of the Civil War in 1861; joined the Confederate army; took an active part in the battle of Pea Ridge,

March 7 and 8, 1862; attacked General Rosecrans at Corinth, Oct. 3–4, 1862, and was defeated with great loss. He was killed in a private quarrel in Maury co., Tenn., May 8, 1863.

**Vanduara.** See PAISLEY.

**Van Dyck, Sir Anthony,** a Flemish portrait and historical painter; born in Antwerp, Belgium, March 22, 1599. He was the seventh child of Frans Van Dyck, a silk and woolen manufacturer, and his second wife, Maria Cuypers, a lady celebrated for her skill in embroidery. In 1609 he entered the studio of Hendrik Van Balen, a capable painter of the place; in his 15th year he began to study under Rubens, and in 1618 he was admitted a master of the Antwerp Guild of St. Luke. He soon came to be recognized as the most promising of the pupils of Rubens. In the contract, dated 1620, for the decoration of the Jesuit Church of Antwerp it was stipulated that he was to assist his master in the pro-

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duction of 39 pictures; and the "Christ Bearing the Cross," in the church of the Dominicians, may be referred to as a work of this period. In 1620 Van Dyck made a brief visit to England, when he appears to have executed the full-length of James I. at Windsor. In 1623, by the advice of Rubens, he started to study in Italy; and, on his way, he is said to have fallen in love with a beautiful country girl of the little village of Saventhem, near Brussels, and to have delayed there, painting his famous "St. Martin dividing his Cloak," still in the parish church, and a "Holy Family," since lost.

Arriving in Venice, he devoted himself to an enthusiastic study of the masterpieces of Titian, Giorgione, and Veronese; and, passing to Genoa, he executed there a series of noble portraits, strongly impressed with the influence of Italian art, many of which are still preserved in the palaces of the families for whom they were painted. In Rome he resided for nearly two years, producing a "Crucifixion" for Cardinal Bentivoglio, and for the Pope an "Ascension" and an "Adoration of the Magi." After visiting Turin and Sicily, he again worked in Genoa, and by 1628 he had returned to his native city, where he painted his great "Ecstasy of St. Augustine" for the chapel of the Augustine monastery, various subjects for the Célibataires, and the splendid "Christ Crucified between Two Thieves" for the church of the Récollets at Mechlin, now in the cathedral there. It was about this period that he executed the fine series of grisaille portraits of eminent contemporaries which were published as engravings by Martin Vanden Enden, and with additions in 1641 by Giles Hendrix of Antwerp. In some 20 of these plates the painter himself etched the heads, and in their early states, before the line work of the engravers has been added, these prints are greatly valued. The astonishing spirit, vigor, and expressiveness of the lines by means of which the features are rendered entitle Van Dyck to rank as one of the master etchers of the world.

In 1629 the painter again visited England, but he received little encouragement, and soon returned. We next find him at The Hague, painting the Prince of Orange and his family, Christian, Duke of Brunswick, and Count Ernest of Mansfield; and in the spring of 1632 he again came to London, under the patronage of the Earl of Arundel, and was warmly received by Charles I., who had been impressed by his portrait of Lanière the musician, and had purchased his "Armida and Rinaldo." He was knighted by the king, appointed his principal painter in ordinary, installed at Blackfriars, and assigned a country residence in Eltham Palace; and in 1633 a pension of $1,000 was bestowed on him, which, however, was very irregularly paid. One of his earliest works during this residence in England was the group of the king, queen, and two of their children, at Windsor; and during the next eight years he painted nearly every distinguished person connected with the court. About 1639 he married, through the influence of the king, Maria Ruthven, granddaughter of the first Earl of Gowrie. Leading a careless life and lavish in his pleasures, Van Dyck suffered from pecuniary straits; and frequently he found difficulty in obtaining payment for the royal commissions. The greater part of 1634 and 1635 was spent in the Netherlands, when he painted Ferdinand of Austria, brother of Philip IV., now at Madrid, and many other portraits, and such religious subjects as "The Adoration

of the Shepherds," in the church at Termonde, and "The Deposition," now in the Antwerp Museum; and at this time he was elected honorary president of the Antwerp Guild of St. Luke. In 1640 he visited his native city for the last time, and then passed to Paris, hoping to be employed by Louis XIII. on the decoration of the Louvre; but here again he was unsuccessful, though he received other commissions. On his return to England he found that political troubles were distracting the country. His own health was now permanently broken, and he died in his house at Blackfriars, Dec. 9, 1641, and was buried in Old St. Paul's.

By universal consent Van Dyck is one of the most refined and graceful of painters. His portraits are full of expression, easy and natural in their attitudes, and the hands, in particular, are most elegant in form and pose. Most of the great English galleries contain samples of Van Dyck's art. Rich collections of his portraits were included in the Manchester Art Treasures Exhibition of 1857, and the National Portrait Exhibition of 1866; and in 1887 a special exhibition of 166 of his works was brought together in the Grosvenor Gallery. Seven of his works are in the National Gallery. These include his portrait of Cornelius Vander Geest, and the noble equestrian portrait of Charles I., purchased for $87,500 from the Blenheim Palace collection in 1885.

**Van Dyke, Henry Jackson,** an American educator; born in Germantown, Pa., Nov. 10, 1852; was graduated at Princeton University in 1873, at the Princeton Theological Seminary in 1877, and at Berlin University in 1878; and soon afterward assumed the pastorate of the United Congregational Church in Newport, R. I. He was chosen pastor of the Brick Presbyterian Church, in New York city in 1883 and continued in that charge till 1900, when he resigned to become Professor of English Literature in Princeton University. His publications include: "The Reality of Religion"; "The Poetry of Tennyson"; "The Christ-Child in Art"; "The Builders, and Other Poems"; "Fisherman's Luck"; "The Friendly Year"; "Preface to Counsel on Books and Reading"; "The Ruling Passion"; etc.

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**Van Dyke, John Charles,** an American art critic; born in New Brunswick, N. J., April 21, 1856; was educated at Columbia and Rutgers Colleges; admitted to the bar in 1877; studied art in Europe, and on his return to the United States devoted himself to literary work and to lecturing on art in Rutgers, Harvard, Princeton, and other universities. He was the editor of the "Studio" in 1883–1884, the "Art Review" in 1887–1888, and the author of "Books and How to Use Them"; "Principles of Art"; "How to Judge a Picture"; "Art for Art's Sake"; "Modern French Masters"; "Nature for its Own Sake"; "History of American Art," etc.

**Van Dyke, Theodore Strong,** an American lawyer and writer on out-door sports; born in New Brunswick, N. J., July 19, 1842; was graduated at Princeton College in 1863; practised law nine years; health failing, became an irrigation engineer, residing in Southern California. He wrote: "Rifle, Rod, and Gun, in California" (1881); "The Still Hunter" (1883); "Game Birds at Home"; "Southern California, the Italy of America" (1887); etc.

**Vandyke Brown,** a pigment obtained from a kind of peat or bog earth of a fine, deep, semi-transparent brown color. It owes its name and reputation to the supposition that it was the brown used by Vandyke in his pictures.

**Vane, Sir Henry,** commonly called Sir Harry Vane, an English statesman and writer; born in Hadlow, Kent, England, in 1612; eldest son of Sir Henry Vane, secretary of state. He was educated at Westminster and Oxford, afterwards completing his education at Geneva, where he became a Puritan and a republican. Returning to England, he found that his religious and political opinions exposed him to much ill will and annoyance, and he consequently emigrated to New England, arriving at Boston in 1635. He was elected governor of Massachusetts in 1636. In 1637 he returned to England, after which he was knighted, entered Parliament, and became treasurer of

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the navy. He took part in the impeachment of Strafford, and was a zealous supporter of Parliament in the civil war and one of the leaders in the Long Parliament. He was also a supporter of the Solemn League and Covenant. He was averse to the execution of the king, and came into conflict with Cromwell in consequence of the forcible dissolution of the Long Parliament (1653). In 1656 he was imprisoned in Carisbrooke Castle for four months, by order of Cromwell, on account of a pamphlet he had written. On his release he continued to resolutely oppose the government of Cromwell and of his son Richard. In 1659 he was a member of the committee of safety and president of the council of state After the Restoration he was sent to the Tower in February, 1660, and subsequently moved from prison to prison. A rising of the Fifth Monarchy party in January, 1661, led to increased severity toward him, and he was tried for high treason before the Court of King's Bench, June 2, 1662, condemned, and beheaded on Tower Hill on June 14.

He wrote various theological works characterized by excessive mysticism, and his religious views gave rise to a small circle of disciples known as Vanists.

**Vanellus,** in ornithology, a genus of *Charadriidæ* (or, if that family is divided, of *Charadriinæ*), with three species, from Palæarctic and Neotropical regions. Bill straight, shorter than head, slightly compressed, points horny and hard; nasal groove wide, nostrils basal, linear, in the membrane of nasal groove; legs slender, lower part naked; tarsi reticulated behind, scutellated in front; feet four-toed, three before, united at the base by a membrane, hind toe very short, articulated on tarsus; wings large, tuberculated or spurred in front of the carpal joint; third and fourth quill feathers longest. *V. cristatus* is the common lapwing.

**Vanessa,** in entomology, the typical genus of the sub-family *Vanessinæ* or *Vanessidi*. Antennæ with the club somewhat prolonged; fore wings with a distinct projection in the hind margin above the middle, the inner margin nearly straight; hind wings generally with a short projection in the hind margin. Caterpillar spiny. The best known species are: *V. atalanta* (= *Pyrameis atalanta*, Newman), the red admiral; *V. io*, the peacock butterfly; *V. antiopa*, the white-bordered butterfly, called also the camberwell beauty; *V. polychloros*, the large, and *V. urticæ*, the small tortoiseshell. Sometimes the comma butterfly, *Grapta C. album*, is called *V. C. album*, and ranked as a sixth species. Darwin notes the resemblance of the closed wings of some species to the bark of trees; but, in spite of their protective coloring, they are palatable to birds and lizards. There is a species, *V. pluto*, in the Oligocene of Radoboj, in Croatia. The pattern of the wings has escaped obliteration. Called also *Mylothritis pluto*, and supposed by some to belong to the *Pieridæ*.

**Vanessinæ,** or **Vanessidi,** anglewings; a sub-family of *Nymphalidæ;* wings angled; caterpillar spiny, of uniform thickness throughout, often living gregariously; chrysalis angulated, head cased, the points sharp and salient.

**Van Eyck.** See Eyck.

**Vanga,** in ornithology, a genus of *Laniidæ* (or, if that family is divided, of *Thamnophilinæ*), with four species, from Madagascar. Bill moderate, straight, compressed, keeled, with tip curved; angle of mouth armed with bristles; nostrils lateral, basal, rounded; tail rather long, graduated. The plumage, which is green-black and pure white, is very conspicuous.

**Vangueria,** in botany, a genus of *Guettardidæ;* shrubs, having the limb of the calyx minutely toothed; the corolla campanulate, with a hairy throat; stamens five, filaments short; fruit succulent, resembling an apple, with five seeds. Natives of Madagascar and India. *V. edulis*, a small tree, a native of Madagascar, has edible fruit; it has, in consequence, been introduced into India. *V. spinosa*, a large, thorny shrub, wild in Eastern Bengal, Burma, Pegu, and Tenasserim, has a round, cherry-like fruit.

**Van Hise, Charles Richard,** an American geologist and educator; born in Fulton, Wis., May 29, 1857; was graduated at the University of Wisconsin in 1879, and was instructor there in metallurgy till 1883, when he was made assistant professor, becoming full professor in 1886. Two years later he accepted the chair of geology in the same institution, and in 1892 was made non-resident professor of structural geology at the University of Chicago. He has done much important work in connection with the United States Geological Survey. In 1892 he joined the editorial staff of the "Journal of Geology." In 1903 he became president of the University of Wisconsin. He was joint author of "The Penokee Iron-bearing Series of Michigan and Wisconsin" (1892); author of "Correlation Papers, Archæan and Algonkian" (1892); "Principles of North American Pre-Cambrian Geology" (1896); "A Treatise on Metamorphism" (1903); etc.

**Van Horn, James J.,** an American military officer; born in Mount Gilead, Ohio, Feb. 6, 1835; was graduated at the United States Military Academy in 1858, and became second lieutenant of the 1st Infantry stationed at Fort Columbus, N. Y. Early in the Civil War he served at San Antonio,

Tex., where he was taken prisoner and held for a year. Returning North, he joined the Army of the Potomac and took part in the engagements at South Mountain, Antietam, Bethesda Church, and Cold Harbor. After the war he served in the South and West. In 1891 he was made colonel of the 8th Infantry, which he commanded during the Santiago campaign in Cuba. He died in Fort Russell, Wyo., Aug. 30, 1898.

**Van Horn, Robert Thompson,** an American soldier, journalist, and politician; born in East Mahoning, Pa., May 19, 1824; was apprenticed to a printer in 1839; removed to Ohio in 1843, and in 1855 settled in Kansas City, Mo., where he established the "Kansas City Journal," which he edited (1855-96). As lieutenant-colonel of the 25th Missouri Volunteers he took part in the battle and siege of Lexington, Mo., the battle of Shiloh, and other engagements. He was a member of the Missouri senate in 1862-64, and served in Congress in 1865-71, 1881-83, and 1895-97.

**Van Horne, Sir William Cornelius,** a Canadian capitalist; born in Joliet, Ill., Feb. 3, 1843. Until 1881 his career was passed in the United States, where he served on various railroads, and was successively telegraph operator, train dispatcher, telegraph superintendent, and division superintendent. In 1872 he became general superintendent of the St. Louis, Kansas City, and Northern railroad, and afterward general superintendent successively of the Minnesota Southern, the Chicago and Alton, and the Chicago, Milwaukee, and St. Paul. In 1881 he was invited to become general manager of the Canadian Pacific railway (then in course of construction), a position demanding exceptional executive ability. It was largely owing to his energy that the railroad was completed from Callender, Ontario, to Vancouver, British Columbia, in 1885, some years before the date required by contract. He became vice-president of the company in 1884, was president in 1888-99, and since 1899 has been chairman of the board of directors. He was largely instrumental in establishing the lines of the Canadian Pacific Company's steamships on the Atlantic and Pacific. As president of the Cuba Company he is also interested in the railroads of Cuba. Sir William is an accomplished linguist and painter and a collector of Oriental art treasures.

**Vanilla,** a genus of epiphytal *Orchidaceæ*, natives of tropical America and Asia. They are distinguished from most other orchids by their climbing habit; they cling with their aërial roots to the stems of trees or to rocks, attain the height of 20 or 30 feet, and obtain their chief sustenance from the atmosphere. There are about 20 species comprised in the genus. The flowers are thick, fleshy, and fragrant, but dull in color. Vanilla is remarkable among orchids as possessing the only species of the order that has any economical value. From the fruit of several species the vanilla of commerce is obtained, the best being produced by the West Indian species, *V. planifolia*; which is now cultivated in many tropical countries. The fruit is cylindrical, about a span long, and less than half an inch thick. It is gathered before it is fully ripe, dried in the shade, and steeped in a fixed oil, generally that of the cashew nut. It contains within its tough pericarp a soft black pulp, in which many minute black seeds are imbedded. It has a strong, peculiar, agreeable odor, and a warm, sweetish taste. Benzoic acid is sometimes so abundant in it as to effloresce in fine needles. Vanilla is much used by perfumers, and also for flavoring chocolate, pastry, sweetmeats, ices, and liquors. Balsam of Peru is sometimes used as a substitute for it. When the fruit of vanilla is fully ripe a liquid exudes from it. Vanilla has ripened its fruit in cooler climates, but the flowers are apt to fall off without fruit being produced, unless care is taken to secure it by artificial impregnation. This is, in some measure, the case even in certain parts of its native countries.

**Vanillic Acid,** $C_2H_5O_4 = CO \cdot OH \cdot OCH_3 \cdot OH$; a crystalline substance obtained by the oxidation of vanilline. It forms white plates, which melt at 211–12°, and sublime at a higher temperature.

**Vanillidæ,** in botany, a family of orchids, tribe *Arethuseæ*. Lindley formerly made it a distinct order, *Vanillaceæ*, on account of its succulent, valveless fruit, its seeds not having the testa of other *Orchidaceæ*, its habit, and its aromatic properties.

**Vanilline,** the methyl ether of protocatechuic aldehyde, found in crystals, in vanilla pods, from which it may be extracted by alcohol. It crystallizes in long, hard needles, slightly soluble in cold water, very soluble in boiling water and in alcohol, melts at 80–81°, and sublimes at 150°. Fused with potassic hydrate it is converted into protocatechuic acid.

**Vanini, Lucilio,** an Italian freethinker; born in Taurisano, Neapolitan territory, in 1585; studied at Naples and Padua the new learning of the Renaissance and the newer learning of physical science; qualified as *doctor utriusque juris*; and took orders as priest. But his "naturalist" — anti-Christian and anti-religious — views soon brought him into collision with the Church. Having taught in various parts of France, Switzerland, and the Low Countries, he had to flee from Lyons to England, where also he was imprisoned. At Genoa, Paris, and Toulouse he was constantly in trouble for

his heresies, and at Toulouse he was arrested and condemned to first have his tongue cut out, then to be strangled, and finally to be burned to ashes (Feb. 19, 1619). From his "Eternal Amphitheater of Providence" (1615), and his "Admirable Secret of Nature" (1616) it is plain that, if he was not an atheist, he taught pantheism of an extreme type; and he was more notable for vanity and audacity than for learning or speculative originality. But as an innovator he has many points in common with Bruno.

**Van Lennep, Henry John,** an American missionary in Asia Minor; born in Smyrna, March 8, 1815. He traveled extensively through the East, was familiar with many Oriental dialects, and published: "Ten Days Among Greek Brigands"; "Travels in Asia Minor" (1870); "Bible Lands" (1879); "The Oriental Album." He died in Great Barrington, Mass., Jan. 11, 1889.

**Vanloo, Jean Baptiste** (von*g*-lō′), a member of a family originally Flemish, in which a love of art seemed indigenous; born in Aix in Provence, in 1684. He painted successively at Nice, Toulon, and Aix, visited Genoa and Turin, and was sent by the Prince of Carignano, son-in-law of the Duke of Savoy, to study at Rome under Benedetto Luti. After a further residence at Turin, he proceeded in 1719 to Paris, and speedily acquired a great reputation as a portrait painter. He was made a member of the Academy in 1731, and Professor of Painting in 1735; and visited London, where he painted Colley Cibber and Sir Robert Walpole. He died in Aix, Dec. 19, 1745. Charles André Vanloo, his younger brother, was born in Nice, Feb. 15, 1705. He also studied at Rome under Benedetto Luti, and then settled in Paris, but later returned to Rome. At Turin he painted for the King of Sardinia a series of subjects illustrative of Tasso, after which he returned to Paris, and was appointed in 1735 a member of the Academy, and later a knight of the order of St. Michael, and chief painter to the king. He died in Paris, July 15, 1765.

**Van Loon, Gerhard** (van lön), a Dutch historian and antiquary; born in Leyden, in 1683. He published among other works a "History of the Netherlands from 1555 to 1716" (4 vols. 1723), which is considered an authoritative work.

**Vannes** (vän), a seaport town of France; capital of the department of Morbihan in Brittany; at the mouth of a tributary of the Gulf of Morbihan; 10 miles from the sea. The cathedral (13th to 15th centuries) is the most important edifice; but the town possesses also an old House of Parliament and many carved houses, and a rich museum of Celtic antiquities. Manufactures of woolens and ropes and some shipbuilding are carried on; and the small port has some trade. Pop. (1901) 16,167.

**Van Ness, Cornelius Peter,** an American diplomatist; born in Kinderhook, N. Y., Jan. 26, 1782; settled in Burlington, Vt., after his admission to the bar, where he practised till 1809, when he was appointed United States district attorney. In 1817–1821 he was a commissioner to arrange boundary lines of the United States under the treaty of Ghent; in 1821–1823 was chief justice of Vermont; and in 1823–1829 was governor of that State. In the latter year he was appointed United States minister to Spain, where he remained till 1837. He was the author of "Letter to the Public on Political Parties, Caucuses, and Conventions" (1848). He died in Philadelphia, Pa., Dec. 15, 1852.

**Van Ness, Thomas,** an American clergyman; born in Baltimore, Md., June 29, 1859; was educated at the Philadelphia High School and Harvard College; entered the Unitarian ministry in 1884, and had churches in Denver, Col. (1885), and San Francisco, Cal (1889–1893), and went to the Second Church in Boston, Mass., in 1893. He wrote "The Coming Religion"; "My Visit to Count Tolstoi"; "The Ideal Commonwealth"; etc.

**Van Ness, William Peter,** an American jurist and author; born in Ghent, N. Y., in 1778. He was the friend of Burr, took his challenge to Hamilton, and was one of Burr's seconds. Under the pen-name of "Aristides" he published: "Examination of Charges against Aaron Burr" (1803); with John Woodworth edited "Laws of New York" (2 vols. 1813); also wrote "Concise Narrative of General Jackson's First Invasion of Florida" (1826). He died in New York city, Sept. 6, 1826.

**Van Rensselaer, Henry Kilian,** an American patriot of Dutch descent; born in Albany, N. Y., in 1744; commanded a regiment in the Revolutionary War; distinguished himself on several occasions; and in October, 1777, aided in the actions which led to the surrender of Burgoyne. After the peace a famous mutiny broke out among his troops. He died in Greenbush, N. Y., Sept. 9, 1816.

**Van Rensselaer, Mrs. Mariana (Griswold),** an American art critic; born in New York city, Feb. 23, 1851. She contributed largely to current periodicals on art and architecture, and published the valuable books: "Art Out of Doors"; "English Cathedrals"; "American Etchers" (1886); "Henry Hobson Richardson and his Works" (1888); and "One Man who was Content, and Other Stories."

**Van Rensselaer, Solomon,** an American military officer; born in Rensselaer co., N. Y., Aug. 6, 1774; entered the army in

1792, and soon afterward, on his promotion to captain, raised a volunteer company with which he joined Gen. Anthony Wayne in Ohio in the Miami campaign, and engaged with distinction in the battle of Maumee Rapids. Again, in 1812, under his cousin, Stephen, then commander of the Army of the North, he was engaged in the battle of Queenstown Heights, where he commanded the attacking party and was severely wounded. He was a member of Congress in 1819–1822; postmaster of Albany, N. Y., in 1822–1839; and in 1824 accompanied Governor Clinton to Ohio in the interest of the Erie Canal. He died in Albany, N. Y., April 23, 1852.

**Van Rensselaer, Stephen,** an American military officer; born in New York, Nov. 1, 1765; was graduated at Harvard College in 1782; elected to the New York Assembly as a Federalist in 1789; was a State Senator in 1791–1796; lieutenant-governor in 1795; and a member of the State Assembly in 1798 and 1808–1810. He became major of militia in 1786, was promoted colonel in 1788, and Major-General in 1801; and in 1812 was assigned to the command of the Northern frontier, in which capacity he commanded at the battle of Queenstown Heights, Oct. 13–14, 1812. On Oct. 24, he resigned his commission because of public dissatisfaction with his conduct in that engagement. He was chosen chairman of the Erie Canal Commission; became a regent of the University of New York; made a geological survey along the line of the Albany and Buffalo canal in 1821–1823; founded the Rensselaer Polytechnic Institute at Troy, N. Y.; and was a member of the State Constitutional Convention in 1821, and of Congress in 1823–1829. He died in Albany, N. Y., Jan. 26, 1839.

**Van Reypen, William Knickerbocker,** an American naval officer; born in Bergen, N. J., Nov. 14, 1840; was educated at the University of New York; appointed assistant surgeon in the United States Naval Hospital service in 1861, and was graduated at the Medical Department of the University of New York in 1862. He served with the frigate "St. Lawrence" in the East Gulf Blockading Squadron in 1863–1864, and at the Naval Hospital at Chelsea, Mass., in 1865; was promoted surgeon in 1868; medical inspector in 1887, and medical director in 1895; represented the medical department of the United States navy at the Twelfth International Medical Congress in Moscow, Russia, in 1897; and was appointed Chief of the Bureau of Medicine and Surgery in December of the same year. During the American-Spanish War he designed and fitted out the ambulance ship "Solace," the first of its kind ever used in naval warfare.

**Van Sant, Samuel R.,** an American executive; born in Rock Island, Ill., May 11, 1844; received a collegiate education. During the Civil War he served for three years as a private in Co. A, 9th Illinois Cavalry. He early engaged in the steamboat business; became a member of the Minnesota Legislature in 1892; was reëlected in 1894, and served as speaker in 1895, being elected to that post by a unanimous vote. He was elected governor of Minnesota in 1901. In the winter of 1901–1902 the Northern Pacific railroad company effected a combination which Governor Van Sant sought to have dissolved in the State courts. While this action was pending President Roosevelt asked Attorney-General Knox to investigate the legality of the merger and it was thought that this action might lead to a suit in the United States courts to dissolve the merger. At the time of writing the matter was unsettled.

**Van Santvoord, George,** an American lawyer; born in Belleville, N. J., Dec. 8, 1819; was graduated at Union College in 1841, and admitted to the bar in 1844; settled in Lafayette, Ind., during the same year. Two years later he began to practise at Kinderhook, N. Y. In 1851 he entered a law firm in Troy, N. Y., and in 1852 and 1856 was a member of the State Assembly. His publications include: "The Indiana Justice: A Treatise on the Jurisdiction, Authority, and Duty of Justices of the Peace in Civil and Criminal Cases" (a standard work); "Principles of Pleading in Civil Actions under the New York Code of Procedure" (1852); "Life of Algernon Sydney" (1853); "Lives of the Chief Justices of the Supreme Court of the United States" (1854); etc. He was killed in a railroad accident in East Albany, N. Y., March 5, 1863.

**Van Schaack, Peter,** an American jurist; born in Kinderhook, N. Y., in March, 1747; was graduated at Columbia College in 1768. In 1773 he was appointed a commissioner to revise the colonial statutes. During the Revolutionary War he sympathized with the British. In June, 1777, he was called before the Committee on Conspiracies and asked to take the oath of allegiance to the Continental Congress. Declining to do so, he was sent to Boston, where he was kept under constant surveillance, and in October, 1778, was exiled from the country. He returned to the United States in 1785, and soon became eminent in his profession. The degree of LL. D. was conferred on him by Columbia College in 1778. His publications include: "Laws of the Colony of New York" (2 vols. 1773); and "Conductor Generalis, or the Duty and Authority of Justices, Sheriffs, Constables, etc. Revised and Adapted to the United

States." He died in Kinderhook, N. Y., Sept. 17, 1832.

**Vansittart, Nicholas,** afterward LORD BEXLEY, an English politician; born in 1766. He was the son of a governor of Bengal, and descendant of a family originally from Sittart, in Jülich. Called to the bar in 1791, he entered Parliament as a Tory in 1796, and after a mission to Denmark, held a series of posts in successive ministries till in 1812 he succeeded Mr. Perceval as Chancellor of the Exchequer, and in 1823 was raised to the peerage and made Chancellor of the Duchy of Lancaster. In 1810 he proposed (against Horner) the motion against resuming cash payments to the Bank of England; at the exchequer he left a large surplus. He was president of the Bible Society, and zealous in religious and philanthropic work. He died Feb. 8, 1851.

**Vanucci, Pietro.** See PERUGINO, PIETRO.

**Vanuxem, Lardner,** an American geologist; born in Philadelphia, Pa., July 23, 1792; was graduated at the School of Mines, Paris, in 1819. Returning to the United States he became Professor of Mineralogy and Chemistry at the South Carolina College. He resigned this post in 1826, and applied himself wholly to the study of geology. In 1827–1828 he examined the geological features of the States of New York, Kentucky, Ohio, Virginia, and Tennessee. In 1836–1841 he had charge of the 3rd Geological District of New York State. He next went to Albany to arrange the State geological cabinet, which was the beginning of the New York State Museum. It was the custom of all connected with the New York survey to meet in Albany at stated seasons to become acquainted and to compare observations. In 1838, while attending one of these meetings Professor Vanuxem made the suggestion that the geologists of Virginia and Pennsylvania be invited to one of the New York meetings for the purpose of devising a nomenclature of geology which could be used by all American geologists. Such a meeting was held in 1840, and resulted in the organization of the Association of American Geologists, which grew to be one of the largest scientific societies in the world. Professor Vanuxem was the author of "Geology of New York, 3rd District" (1842); "An Essay on the Ultimate Principles of Chemistry, Natural Philosophy, and Physiology" (1827); etc. He died in Bristol, Pa., Jan. 25, 1848.

**Vanuxemite,** a white, massive mineral substance, occuring with zinc ores at Sterling Hill, N. J.; hardness, 2.5–3; sp. gr., 2.5. An analysis gave: Silica, 35.64; alumina, 11.70; protoxide of zinc, 32.48–36.0; water, 14.80–19.88. As Dana points out, this cannot be regarded as a distinct species, but rather as a mixture of clay with hydrated silicate of zinc.

**Van Veen, Otto,** or **Ottovenius,** a Dutch painter; born in Leyden about 1556; studied under Zucchero in Rome; and was the first who explained the principles of chiaroscuro to Flemish artists. He was invited by the Emperor Ferdinand II. to settle in Vienna, but returned to Holland and served the celebrated Alexander Farnese, then governor of the Spanish Netherlands. On the death of his patron he opened an academy at Antwerp, where Rubens was among his pupils. He was appointed Master of the Mint at Brussels, and subsequently declined the invitation of Louis XIII. to visit Paris. He was an able painter of allegories and religious groups, but is chiefly remembered as the "master of Rubens." He died in Brussels in 1634.

**Vanvitelli, Luigi,** an Italian architect; born in Naples, Italy, in 1700. Though he early developed skill in painting, and by 1720 had made frescoes in the chapel of the relics in Santa Cecilia, he turned his attention to architecture. In 1726 he was made architect of St. Peter's, and till his death had charge of all its great work. He made copies of many pictures for reproduction in the mosaic of the nave, and strengthened the cupola with iron bands. He built a beautiful palace in Caserta for Charles III.; constructed near the Caudine Forks, an aqueduct connecting two mountains; etc. He died in Naples, Italy, March 1, 1773.

**Van Vleck, John Monroe,** an American educator; born in Stone Ridge, N. Y., March 4, 1833; was graduated at Wesleyan University in 1850; was assistant in the "Nautical Almanac" office, Cambridge, Mass., in 1851–1853; became adjunct Professor of Mathematics in Wesleyan University in 1853; Professor of Astronomy and Mathematics in 1858; and was acting president in 1872–1873, 1887–1889, and 1896–1897. He accompanied the Solar Eclipse Expedition to Mt. Pleasant, Ia., in 1869. He was a member of the principal scientific societies.

**Van Vliet, Stewart,** an American military officer; born in Ferrisburg, Vt., July 21, 1815; was graduated at the United States Military Academy in 1840, and commissioned a 2d lieutenant in the 3d United States Artillery; was promoted captain and became assistant quartermaster in 1846. He took part in the action at Monterey and was present at the siege of Vera Cruz and Mexico, in all of which he commanded his company. From 1847 till the outbreak of the Civil War he was actively engaged at frontier posts. In 1861–1862 he was chief quartermaster of the Army of the Potomac.

He participated in all of the engagements from Gaines' Mills to Malvern Hill; was promoted lieutenant-colonel and deputy quartermaster-general in July, 1866; brevetted Major-General U. S. A. in 1865, for "faithful and distinguished services during the war"; promoted colonel and assistant quartermaster-general in June, 1872; and was retired in 1881. He died in Washington, D. C., March 29, 1901.

**Van Wert,** a city and county-seat of Van Wert co., O.; on the Pennsylvania and the Fort Wayne and Chicago railroads; 27 miles W. N. W. of Lima. It contains a number of churches, a court house, National and other banks, and several newspapers. It has several planing mills, and manufactures of wool, stoves, wagons, etc. Pop. (1900) 6,422; (1910) 7,157.

**Van Wyck, Charles Henry,** an American lawyer; born in Poughkeepsie, N. Y., May 10, 1824; was graduated at Rutgers College in 1843; was district attorney of Sullivan co., N. Y., in 1850–1856; and a member of Congress in 1859–1863. He entered the Civil War as a colonel of the 56th New York Volunteers, with which he served till the conclusion of peace; was again in Congress in 1866–1870; settled in Nebraska in 1874; and was elected to the United States Senate as a Republican in 1880. During his career in the Senate he was a strong opponent of the policy of secrecy in executive sessions. He exerted much influence in forming the Farmer's Alliance movement in Nebraska, and was the Populist candidate for governor in 1892. He died in Washington, D. C., Oct. 24, 1895.

**Van Zile, Edward Sims,** an American journalist and novelist; born in Troy, N. Y., May 2, 1863; was graduated at Trinity College, Hartford (1884); did editorial work in Troy (1884–1886), and on the New York "World" (1886–1890); later was manager of Literary Bureau, and editor of "Current Literature." He wrote: "Wanted — A Sensation"; "The Last of the Van Slacks"; "A Magnetic Man"; "Don Miguel, and Other Stories"; "The Manhattaners"; "A Crown Prince"; "Kings in Adversity" (1897); "With Sword and Crucifix" (1899); "A Novel Complication" (1901); etc.

**Vapereau, Louis Gustave** (väp-rō′), a French compiler; born in Orléans, France, April 4, 1819. He was Professor of Philosophy at the College of Tours for 10 years; admitted to the bar in 1854, and about the same time made editor of the famous "Universal Dictionary of Contemporaries" (1858; 6th ed. 1891–1893). Among his other important works are: "Literary and Dramatic Year" (11 vols. 1859–1869); "Universal Dictionary of Literatures" (1876); "Historical Elements of French Literature" (2 vols. 1883–1885). He was Inspector-General of Public Instruction in 1877, and received the Cross of the Legion of Honor in 1878. He died in 1906.

**Vapincum.** See GAP.

**Vapor,** in physics, an aëriform fluid into which some volatile substance is changed by the action of heat. Vapor is essentially the same as gas, but the word vapor is conventionally limited to the gaseous state of a body which is liquid or solid at ordinary temperatures, while the term gas is applied to aëriform bodies which are in that rarefied state at ordinary temperatures. Thus we speak of hydrogen gas, but of watery vapors. Vapors, like gases, have a certain elastic force, by which they exert a pressure on every part of any vessel in which they are enclosed. Vapors are formed instantly in a vacuum; in the atmosphere they are generated more slowly. When not saturated they exactly resemble gases in their action; when saturated and in contact with the liquid by which they were generated, they can neither be compressed nor expanded, but remain constant, both in their elastic force and in their density. Vapors of different composition vary in density. Thus if atmospheric air be taken as unity, the vapor of water = 0.6235, that of alcohol 1.6138, that of sulphur 6.6542, and that of mercury 6.9760.

**Vaporer Moth,** in entomology, the *Orgyia antiqua.* The fore wings of the male are rich brown, clouded with darker tints, and having a small spot near the anal angle; the hinder wings are brown. In the females the wings are rudimentary. The male is common from July to October, and is often seen in the streets of cities. The female remains in the cocoon, on the outside of which she deposits her eggs in autumn. The larvæ, which first appear in June and continue for some months, are slaty gray, having four or five wart-like spots on each segment, with yellow and black tufts. Common in gardens, on rose bushes and many other plants. The scarce vaporer moth, *O. gonostigma,* has several small white spots on the wings of the male. The larva feeds in autumn on oak, hazel, and bramble. The perfect insect appears in June.

**Var,** a department in the extreme S. E. of France; area, 2,349 square miles; pop. (1906) 324,638. The department receives its name from the Var river, which formerly served as its boundary on the E., but which, since the arrondissement of Grasse was taken from Var and added to the Alpes Maritimes, now belongs entirely to the latter. Var is well watered by a great number of streams, of which the chief are the Gapau, Argens, and Bianson. In the N. and N. E. it is mountainous, being traversed by a branch of the Alpes de Provence, called the Monts de l'Esterel. Between the moun-

tains and the watercourses are many very fertile valleys. The climate, tempered by the altitude of the surface, is pleasant. Fruits of all kinds are here cultivated with remarkable success; tobacco is grown, and much wine is produced. The department abounds in minerals, and carries on an active commerce. It is divided into the three arrondissements of Draguignan, Brignoles, and Toulon. Capital, Draguignan.

**Varangians,** or **Varagians,** the name applied to the Norse vikings, who, at the close of the 9th century, founded various principalities in Russia. Some of them afterward entered the service of the Byzantine emperors, and became the imperial guards at Constantinople. Here they were recruited by Anglo-Saxons and Danes, who fled from England to escape the Norman yoke.

**Variable Quantities,** in mathematics, quantities which admit of an infinite number of set values, in the same equation. Such quantities as are regarded as being subject to continual increase or decrease, in opposition to those which are constant, remaining always the same.

**Variable Stars,** in astronomy, periodical stars; stars which vary in their luster at different times. Compared with the enormous number of the heavenly bodies they are but few. Sir John Herschel gave a list of 66 known to him, and considered it nearly complete. The most remarkable is ALGOL (*q. v.*). Another is Mira Ceti. Goodricke, who in 1782 discovered the variability of Algol, attempted to account for it by the hypothesis, which Sir John Herschel also accepted, that some opaque body, temporarily interposed between the observer and the star, intercepted a large part of the emitted light.

**Variable Toad,** in zoölogy, the *Bufo variabilis,* a species common in France. It has the hind limbs and feet nearly as large as those of the frog. Called also the green toad, from its color.

**Variation,** in astronomy, any deviation from the mean orbit or mean motion of a heavenly body produced by the perturbation of another body or bodies. Thus the planets are considered to move mathematically in elliptic orbits, which would be the case if they were subject to the attraction of the sun only, but being acted on by each other, there is supposed to be a minute and slow but constant variation in the elements of the ellipse. Variations which are compensated in short intervals are called periodic, and those which require for their compensation a long period are called secular.

In biology: (1) A tendency in all organisms to vary slightly from other organisms produced by the same parents. (2) Hereditary modification. (3) A modification directly due to the physical conditions of life; such as the dwarfed condition of shells in the Baltic, or of stunted plants on Alpine summits. (4) An organism, or a group of organisms, exhibiting modification due to external conditions.

"The term variation has been employed by some authors to designate forms less permanent than varieties, but the term has not obtained general acceptance."—"Chambers' Encyclopædia" (ed. 1867), ix. 716.

In grammar, a change of termination of words, as in declension, conjugation, comparison, and the like; inflection. In music, an air or theme with variations is a musical composition in which a simple melody is first given out, and then several times repeated, each repetition containing changes by means of broken harmony, counterpoint, broken rhythm, the arpeggio, scale passages, and even by modification of key. The earliest forms of a variation were the "divisions" added to a ground bass; then there followed the changes above described, but the character of variations in modern music has gradually developed into a series of sound pictures, of which the theme is indeed the main subject, but is represented under various phases of sentiment, expression, thought, and æsthetic coloring.

In navigation, the angle included between the true and magnetic meridians of any particular place. If the direction of the true meridian at any given place were known, the variation of the needle would be found by simply taking the bearing of this line with the compass. If the bearing of the meridian is E. of N., the variation is to the W.; if the bearing is W. of N., the variation is to the E. In order, therefore, to find the variation of the needle at any place, we first find the direction of the true meridian, or of some line which makes a known angle with it; we then observe the bearing of this line; from this result the variation is easily computed. The line most usually employed is the line of greatest elongation of the pole star, either to the E. or W. At London, in 1550, the deviation was 11° 17′ E.; about 1669 it was 0°. It then began to deviate to the W., till it attained its maximum in 1815, 24° 17′ 18″.

Annual variation, in astronomy, the annual change in the right ascension or declination of a star produced by the combined influence of its own motion and the precession of the equinoxes. Calculus variations, a method in which the laws of dependence, binding together variable quantities, are themselves subject to change. Variation of elements, in astronomy, physics, and mathematics, changes in the elements entering into the calculation of any figure, rate of motion, etc. Variation of the moon, in astronomy, irregularity in the moon's motion and in the form of her orbit, depending on

the angular distance of the luminary from the sun. When nearest the earth the true longitude, as seen from the earth, is gaining on the mean longitude; it will be the reverse when she is in quadratures (farthest from the earth), and at intermediate points nearly coinciding with octants, she will be neither gaining nor losing. But at these points the amount of gain or loss will have reached its maximum. The entire variation produced by this cause in the moon's longitude is 1° 4′. Variations of the barometer. See BAROMETER.

**Varicelloid Smallpox,** modified smallpox, in which the eruption seems to stop at its vesicular stage, most of the vesicles drying up instead of developing into pustules. Called also abortive smallpox.

**Varick, Theodore Romeyn,** an American surgeon; born in Dutchess co., N. Y., June 24, 1825; was graduated at the Medical Department of the New York University in 1846. He settled in Jersey City, N. J., in 1848; and became famous as a surgeon. He introduced the use of cocaine in capital amputations, and was the first in the United States to employ the method of Trendelenberg in performing amputations at the hip joint. He also perfected a method for the use of hot water in surgery, by which he performed the largest number of successful operations known to his time, failing in only three cases out of 54. He originated, too, the use of hot water in checking the ooze in laparotomy. His publications include "Urticaria produced by Hydrocyanic Acid"; "Complete Luxation of the Radius and Ulna to the Radical Side"; "Distal Compression in Inguinal Aneurism"; "The Use of Hot Water in Surgery"; "Protective Treatment of Open Wounds"; etc. He died in Jersey City, N. J., Nov. 23, 1887.

**Varicocele,** a varicose condition of the veins of the spermatic cord, due to increased pressure within the vessels, or to diminished resistance in their walls and in the surrounding structures.

**Varicose Aneurism,** a form of aneurism in which a communication has been formed between the aorta and either of the venæ cavæ, one of the auricles, the right ventricle, or the pulmonary artery.

**Varicose Veins.** When a vein becomes dilated at a certain part of its course, for no apparent physiological object, such as relieving the venous circulation elsewhere (as, for example, in the case of the superficial abdominal veins enlarging in order to relieve a compressed vena cava), it is said to be varicose, the actual dilatation being called a *varix* (a word used in this sense by Cicero and Celsus). Some veins seem to be unaffected by varices, which, however, are of common occurrence in the sub-mucous veins of the rectum (constituting hemorrhoids or PILES (*q. v.*), in the spermatic veins, giving rise to varicocele, and in the veins of the lower extremities. They are occasionally (but very rarely) found in other veins. Certain conditions of the system favor the formation of varices, among which may be noticed an indolent temperament, and a debilitated condition of the general system, accompanied by a relaxed state of the walls of the veins; and possibly also a congenital predisposition or hereditary tendency. Persons with such a disposition are more likely to suffer from this affection if their occupation is one which involves much standing or walking; and cooks, washerwomen, and foot-soldiers have been selected as specially prone to varicose veins. Varices may occur at almost any period of life, but are chiefly developed during middle age. Their formation is aided by any condition of the system which impedes the circulation, as certain diseases of the heart, lungs, and liver, and by continued high living, which is especially liable to induce hemorrhoids. Direct pressure on the veins, *e. g.*, by the use of garters, or by habitual constipation, is often an important factor in their production. From the researches of Andral, it appears that in varicose veins the coats of the dilated vessels may become thickened or may become thin; that they be lengthened so that the veins become tortuous; and that the dilation may be unequal, giving rise to the formation of pouches; and that, in consequence of the enlarged caliber of the vessels, the valves only act imperfectly, and gradually undergo degeneration.

Varicocele occurs as a tumor in the scrotum, most often on the left side, generally and aptly described as feeling under the fingers "like a bag of worms." It is rarely serious or painful, but often causes much anxiety and mental distress. The use of a well-fitting suspensory bandage and free bathing with cold water are generally efficient in keeping it in check; but it is often removed by operation.

Varices occurring in the leg, to which our remaining observations apply, commonly give rise to deep-seated aching pain in the limb, with a sense of weight, fullness, and numbness, before there is any external appearance of the affection. In a more advanced stage the ankles swell in the evening, and the feet are always cold. After a time a small tumor or bluish tint appears, which disappears on pressure, but returns on the removal of the pressure, and is caused by a dilating vein. This dilation extends, and forms knotty, irregular tumors, soft to the touch, diminishing on pressure or on the patient's assuming a horizontal posture, and giving a bluish tint to the adjacent skin. These tumors commonly occur in the

middle of the leg, along the track of the saphena veins, but they often extend along the whole of the leg and thigh. Among the troublesome consequences of varicose veins are the obstinate ulcers, known as varicose ulcers, to which they give rise; and it must be borne in mind that occasionally, when the skin gets thinned by prolonged pressure, the varices burst through it, and give rise to hemorrhage, which, if not promptly stopped, may cause fainting, and even death. When such an accideent occurs the patient should at once be placed in a horizontal position, and the leg raised, in which case the bleeding will probably cease. If it continue, a pad of lint must be pressed on the mouth of the bleeding vessel by means of a few turns of a bandage round the limb.

Treatment must in the main be palliative; pressure on the veins by garters, constipation, etc., must be removed; the general health must be attended to, liberal diet with tonics, or restricted diet with mild purgatives, being enjoined according to the patient's requirements. The weakened veins must be supported when the patient is going about by suitably regulated pressure; the application of a domett or india-rubber bandage every morning before rising is the most satisfactory method; but an elastic stocking is less trouble, and is more commonly used. The obliteration of one set of varices by operation is generally followed by the dilatation of adjacent veins. If, however, the varicose veins give rise to much discomfort, or prevent the healing of an ulcer, operation is often justifiable, and is followed by great relief. The operations employed may consist in the use of caustics, subcutaneous division of the veins, compression by ligatures or metal pins, or excision.

**Variegation,** in plants, is a condition in which other colors are exhibited in parts where the normal color should be green. Thus white, yellow, or other tints take the place of green in the leaves and other herbaceous parts. Yet variegation is regarded in botany as a disease, the causes of which are unknown. All that is yet determined respecting it is that it is invariably accompanied by a more or less complete suppression of the chlorophyll, the green granular matter which underlies the cuticle of the green parts of plants. Though often presenting similar peculiarities to chlorosis, another plant disease, the cause of which is equally obscure, variegation is distinguished from it by the presence of chlorophyll in larger or smaller patches in the leaves, branches, or stems of the affected subjects. Variegation is usually a permanent characteristic, or may be made so by careful methods of propagation, and is compatible with vigorous health. These considerations give an importance to variegated plants in ornamental gardening which they would not otherwise possess. Variegated pelargoniums and many other bedding plants, perennial herbs and annuals, and some shrubs and trees derive their popularity as ornaments of the flower garden from their variegation, which in many cases is so brilliant that it is substituted for flowers in the production of color effects. Variegation is rarely perpetuated by seed; when it appears in a plant it can only be increased by means of cuttings, layers, division, or budding and grafting. In rare instances some tendency is shown in variegated plants to revert to the normal state; this is especially so in those that are grafted or budded, and is supposed to be due to the action of the stock on the scion. Inversely also the scion is found to exert a similar influence on the stock occasionally, as in the case of some abutilons, causing a perfectly distinct and permanent variegation to appear in the branches which spring from it. Reversion to the original state is usually prevented by pruning away the first indications of it, always removing the bud whence the green part shoots. In herbs which are propagated by division annual division is in many cases necessary in order to preserve the variegation.

**Varin, Charles** (vä-ra*ng'*), a French vaudeville writer; born in Nancy, France, in 1793. Among his productions are: "Borrowed Wives" (1832); "A Ball in High Life" (1836); "My Sister Mirette" (1861); "The Ill-Guarded Girls" (1865); "Madame Ajax" (1866); etc. He died in Paris, in 1869.

**Variolite,** a variety of felspar, generally of a dark-green color speckled with gray; but sometimes exhibiting white, blue, red, and other intermediate tints. The name has reference to the remarkable appearance presented by weathered surfaces of the stone, which display projecting black spots or points, each surrounded by a brown (sometimes by a white) ring, and occasionally even by a second whitish circle. Variolite takes a beautiful polish, and is used in that state for ornamenting cabinets, for caskets, snuff boxes, etc.

**Varius, Lucius,** a Latin poet, the intimate friend of Vergil and Horace. He was patronized by Mæcenas, and his poems, epic and dramatic, were very highly esteemed. Some fragments of them are preserved. He died in 19 B. C.

**Varix,** in pathology, the dilatation and thickening of the veins with lengthening and tortuosity, and projection of certain points in the form of knots or knobs, in which the blood coagulates, fibrin is deposited, and in the center sometimes even osseous matter; in addition the coats of the veins are diseased. Occasionally partitions are formed,

and perforations communicating with the surrounding cellular tissue, which is generally more or less diseased; this form is chiefly found round the anus, causing piles or hemorrhoids. The veins chiefly affected are the saphenous, spermatic, and hemorrhoidal, most of all the first, producing varicose veins and ulcers of the legs in women, and clerks who sit cross-legged at their desks. In zoölogy, one of the ridges or spinose lines which mark the former position of the mouth in certain univalve shells.

**Varna,** a fortified town of Bulgaria (of which it is the chief port), on the Black Sea. It has a good harbor, and a large trade with Constantinople in grain. It is the see of a Greek archbishop. It was taken by the Russians in 1828, but restored to Turkey a year later by the peace of Adrianople. The Crimean expedition sailed from Varna in 1854. Pop. (1905) 37,417.

**Varnhagen, Francisco Adolpho de, Viscount of Porto Seguro** (värn-ä′gen), a Brazilian diplomatist and historian; born in Sao Joao de Ypanema, Sao Paulo, Feb. 17, 1816. His youth was passed in Portugal; on his return to Brazil in 1841, he was appointed to diplomatic posts in Lisbon, Paraguay, Peru, Vienna, and other places. He was indisputably the first of Brazilian historians, his works being distinguished by profound research and lucid style. Chief among them are: "General History of Brazil" (2 vols. 1854–1857); "History of the Struggles with the Dutch in Brazil" (2d ed. 1874); "Anthology of Brazilian Poetry" (1850–1853); biographical studies; monographs on Amerigo Vespucci; etc. He died in Vienna, Austria, June 29, 1878.

**Varnhagen von Ense, Karl August** (värn-hä′gen fon en′se), a distinguished Prussian diplomatist, regarded as one of the best of German prose writers; born in Düsseldorf, Feb. 21, 1785. In 1814 he married Rahel Levin, an accomplished Jewess, and became conspicuous in Berlin society. His numerous works consist mainly of biographical studies — including two memorials of his wife, who died in 1833 — tales, criticisms, and poems. Of his "Diaries" several volumes have appeared. He died in Berlin, Oct. 10, 1858.

**Varnhagen von Ense, Madame** (RAHEL ANTONIE FRIEDERIKE LEVIN), the wife of Karl August Varnhagen von Ense, a woman of great intellectual abilities and wide intellectual sympathies, who might almost be called the foster mother of German genius, a Jewess by birth, sister of the poet Ludwig Levin (afterward Robert-Tarnow); born in Berlin, Prussia, May 19, 1771. The first half of her life was spent in various towns of Germany, in Paris, and in Prague. Her first love having been killed in battle against Napoleon's army, Rahel became a Christian and married (in 1814) Varnhagen von Ense. Her house in Berlin was a gathering place for men of genius — philosophers poets, artists, and writers. She herself was greatly influenced when a girl by the writings of W. von Humboldt and F. Schlegel, and especially by Goethe, whom she called her god; and she in her turn recognized and encouraged the genius of Jean Paul, Tieck, De la Motte Fouqué, F. von Gentz, Fichte, Hegel, Gans, Heine, Thiers, Benjamin Constant, and others, but especially the writers of the Romantic school. Into the patriotic struggle against Napoleon she threw herself heart and soul. Her husband published a collection of her writings and letters as "Rahel" (1833), and three years later another collection. See also her correspondence with Veit (1861) and with Varnhagen (1875). She died in Berlin, March 7, 1833.

**Varnish,** a thin, resinous fluid, which, when spread over the surface of wood, metal, glass, or other solid substance, forms a shining coating, impervious to air and moisture. The great number of varnishes consist of some resinous material, dissolved in linseed oil, alcohol, or some liquid hydrocarbon such as turpentine and benzole. Those made by dissolving a resin in a non-volatile drying oil, like that from linseed, are called oil varnishes; and those prepared by using volatile solvents (alcohol, benzole etc.) for the resins are called spirit varnishes. In the case of the latter the solvent becomes dissipated as the varnish dries, so that when any surface is coated with a varnish of this kind only a film or coating of resin remains, which is apt to crack and peel off; but means are taken either in the preparation of the varnish or in the laying of it on to counteract this tendency. With an oil varnish, on the contrary, the oil remains as part of the coating, giving it toughness, while the resin gives it hardness.

Bookbinders use a spirit varnish, composed of elemi, mastic, and sandarac resins, together 14 parts, Venice turpentine 3 parts, and alcohol 30 parts. They also use among other lacquers one consisting of shellac 10, turpentine and alcohol 30 parts. A good spirit varnish for woodwork is sandarac resin 40, Venice turpentine 4, and alcohol (methylated spirit) 120 parts.

The best oil or fat varnishes are prepared from hard resins, along with linseed oil and turpentine. Copal and amber, the two hardest resins, require a preliminary heating or fusing before mixing them with the solvents. The proportions given for a good copal varnish are 30 parts of melted copal resin, 100 parts of linseed oil, and 70 parts

of oil of turpentine, part of the oil in a hot state being first mixed with the melted resins. Three parts of litharge, or ¼ of a part of borate of manganese is added to act as a "dryer." Throughout the process of preparing the varnish a carefully regulated heat is used, and the temperature of the mixture is allowed to fall to 140° F. before the turpentine is added. A copal varnish is also made on a more limited scale by a newer process, which consists in first treating the resin with a powerful solvent (afterwards drawn off by distillation), such as acetone or ether, and afterward adding "manganese" oil (linseed oil and borate of manganese) and turpentine. There are several kinds of copal resins, but the best kind is obtained from Zanzibar, and is now known to be produced by *Trachylobium verrucosum*. Inferior "copal" varnishes are made from kauri and other cheap resins. The use of oil varnishes which are sold at a low price (some of them at one-half that of good copal) should be avoided, as many of these never dry properly. An elastic varnish, useful for rendering textile fabrics waterproof, can be made with the aid of heat, by mixing together common resin 2 pounds, caoutchouc 16½ ounces, linseed oil 2 pounds. It may be stated here that, from the inflammable nature of the materials used, the making of most varnishes is attended with much risk of fire.

Oil varnish is extensively used for coating the internal woodwork of houses, either after it has been previously painted, or simply to cover the bare wood without hiding its grain. Good copal varnish is the best kind that can be used for this purpose. If properly put on it forms a fine glossy, enamel-like surface, which is very durable, and stands washing with soap and water repeatedly without injury. To produce such a surface at least five coats of the varnish are required, and each in turn is rubbed smooth with pumice except the last. It is only in the best class of work, however, that more than two or three coats are given. A coating of varnish does not increase the durability of oil paint on external woodwork.

A pure transparent mastic varnish is used for oil pictures, but, as it has the defect common to spirit varnishes of being easily abraded, copal oil varnish is often preferred for this purpose. A less pure mastic varnish is used for maps. As spirit varnishes dry very quickly, it is often convenient to use suitable kinds of them for coating metal, wood, etc., in cases where it is inconvenient to give proper time for oil paint or oil varnish to dry.

**Varnish Tree,** the name given to various trees which furnish varnish. They are chiefly natives of the hotter parts of the Eastern Hemisphere, and the varnish tree of each country or large province is, as a rule, different from that of others. In Tenasserim, Pegu, etc., the varnish tree is *Melanorrhœa usitatissima*, sometimes specifically called the Black, or Martabam varnish; that of Japan is *Rhus vernicifera* and *Stagmaria verniciflua;* that of Sylhet, *Semecarpus anacardium*. The varnish tree of the countries bordering on the Mediterranean is *Rhus coriaria*. It is a tree the leaves of which are divided into five to seven pairs of hairy leaflets with a terminal one. It is 15 to 20 feet high.

**Varro, Caius Terrentius,** the Roman commander who was defeated at Cannæ by Hannibal in 216 B. C.

**Varro, Marcus Terentius,** a Roman author; born probably of equestrian rank in the Sabine town of Reate, in 116 B. C. He studied under L. Ælius Stilo, and at Athens under Antiochus of Ascalon, whose philosophy Cicero makes him expound as an interlocutor in the "Posterior Academics." He saw some service under Pompey, and in the civil war was legate in Spain with Petreius and Afranius. He awaited the result of Pharsalia with Cicero and Cato at Dyrrachium, and was kindly treated by the conqueror, who appointed him to be librarian for his intended collection. The second triumvirate plunged him into danger, and Antony plundered his splendid Cacine villa, burned his beloved books, and placed his name in the list of the proscribed. But he was soon exempted, and Augustus even restored his property, so that he was able to spend his latest years in peace. He survived till 27 B. C. Varro was a man of upright and honorable character, a monument of the old-fashioned Roman virtues, even to their hard and unsympathetic side. His diction shows qualities of the same kind — it is pithy and vigorous, but harsh, abrupt, without flexibility or charm. The total number of his works amounted to about 620 books, belonging to 74 different works. Of the poetical works (satires, pseudo-tragedies and poems) nothing is known but the names. But of the 150 books of the "Satires of Menippus," a medley of prose and verse, imitated from the Cynic satirist Menippus enough fragments (ed. Riese, 1865; Bücheler, 1882) remain to prove the greatness of the loss. Here are in singular medley grotesque personifications of ideas, ridicule of the philosophers, mythology, erudition, proverbs, bitter satire at the social corruptions of the day, and praise of the homely virtues of the good old times, the whole spirited and rich in humor, if seldom artistic in form. Varro's prose writings embraced oratory, history both general and literary, jurisprudence, grammar, philosophy, geography, and husbandry. The most important of these were his "Human and Divine Antiquities," a work of vast learning

in 41 books, a mine in which burrowed Pliny, Plutarch, Gellius, Festus, Macrobius, as well as the Christian fathers, especially St. Augustine; "The Latin Language," in 25 books, of which only v.–x. are extant (ed. C. O. Müller, 1833; L. Spengel, reëdited by his son, 1885), on the formation and inflection of words, and on syntax, marred by arbitrary arrangement, and etymologies due to mere empirical word play; "Rustic Affairs, Part III.," almost entire (ed. Keil, Leip. 1884), in dialogue form, on agriculture, cattle, bird and fish breeding. His "Discipline, Part IX.," deserved to live, being an attempt at an encyclopædia of the liberal arts; his "Imagination, Part XV.," or "Hebdomades," was a series of 700 illustrated biographies of Greek and Roman celebrities with a metrical eulogium on each.

**Varro, Publius Terentius,** surnamed ATACINUS, a Roman poet; born at Atax, Narbonese Gaul, about 82 B. C. His works, of which but small fragments remain, are: "The Sequanian War," an epic celebrating the exploits of Cæsar in Gaul; some "Satires," of which Horace speaks slightingly; "The Argonauts," an epic in imitation of Apollonius Rhodius, highly praised by Ovid; a number of other imitations of Greek poets, among them "Chorography," a didactic poem on geography, and "Ephemeris," a poem on weather prognostics. He died about 37 B. C.

**Vartabad, Vartabed,** or **Vartabet,** an order of ecclesiastics in the Armenian Church, consisting of clerics with monastic vows, in this differing from the parochial clergy who must not merely be married, but have at least one child, before they are appointed to office. They are the only men under monastic vows in the Armenian Church, no lay monks being recognized. The bishops are taken from the Vartabads.

**Varuna,** in the Vedic mythology of the ancient Hindus, one of the Adityas, or offsprings of Aditi, the deity of space, and among these, one of the most prominent. He is often invoked together with Mitra, sometimes together with Agni, the god of fire, or with Indra, or other elementary deities; but frequently he is also separately praised by the poets of the Vedic hymns. He is particularly the god of waters.

VARUNA.

**Varus, Publius Quintilius,** a Roman general, celebrated in consequence of the great defeat that he suffered at the hands of Arminius, leader of the Germans. In 7 B. C., having received from Augustus the command to introduce the Roman jurisdiction into the German territory just conquered by Drusus, he was carrying out his mission when he was suddenly attacked by an immense host under Arminius, and his whole army was destroyed. Varus put an end to his own life. The exact scene of this battle is disputed. See ARMINIUS.

**Vasari, Giorgio** (vä-sä′rē), an Italian painter and architect, but most distinguished as the biographer of artists; born in Arezzo, Tuscany, July 30, 1512. He studied under Luca Signorelli, Michael Angelo, and Andrea del Sarto. As an architect he showed great ability, as exemplified in his designs of the Palazzo degli Uffizi at Florence, and the church of Abbadia at Arezzo. As a painter he was less successful. His principal paintings are a "Lord's Supper," in the cathedral of Arezzo, several works in the Palazzo Vecchio in Florence, and in the Vatican in Rome. His "Lives of the Most Excellent Painters, Sculptors, and Architects" is of great interest, but it exhibits many errors respecting the earlier masters; and it is also guilty of partiality toward the Tuscan artists. It was first printed in 1550, and an enlarged and improved edition appeared in 1568. It has been translated into English. Vasari died in Florence, June 27, 1574.

GIORGIO VASARI.

**Vasco de Gama.** See GAMA.

**Vasconcellos, Carolina Wilhelmina Michaelis de** (väs-kon-sel′ los), a German-Portuguese littérateur, wife of Joaquim Antonio; born in Berlin, Prussia, March 15, 1851. She was a contributor to the leading literary magazines and reviews of Germany and Portugal and wrote: "Studies on the Meanings of Spanish Words" (1886); "Romance Studies" (1891); "History of Portuguese

Literature" (1893); "Etymological Fragments" (1894).

**Vasconcellos, Fonseca e, Joaquim Antonio da,** a Portuguese biographer and historian; born in Oporto, Portugal, Feb. 10, 1849; Professor of German Language and Literature in the Lyceum there. His principal works are: "The Musicians of Portugal" (1870); "Reform in the Teaching of the Fine Arts" (3 vols. 1877–1879); "Albert Dürer and his Influence in the Peninsula" (1877); "Francis the Hollander" (1879).

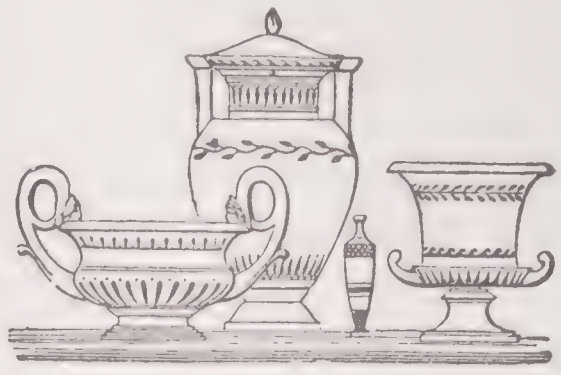
**Vasculares,** a class of plants founded by Lindley in 1830. It is not quite identical with De Candolle's vascular plant, for it included only flowering plants, with the two sub-classes, exogens and endogens, excluding the higher cryptogams, which were relegated to the class of cellulares or flowerless plants.

**Vascular Plants,** a primary division of plants established in 1813 by De Candolle. He defined it as plants furnished with cellular tissue and vessels, and whose embryo is provided with one or more cotyledons. Called also by him cotyledonous plants. This division comprehended the exogens, endogens, and the higher cryptogams.

**Vascular System,** that portion of the interior of a plant in which spiral vessels or their modifications exist. In an exogenous stem, the vascular system is confined to the space between the pith and the bark. It chiefly consists of ducts and pitted or woody tissue collected into compact, wedge-shaped, vertical plates, the edges of which rest on the pith and the bark, while the sides are in contact with the medullary rays. It comprises the medullary sheath, which consists of spiral vessels and woody tissue intermixed. In an endogenous stem, the vascular system exists in the form of fibrous bundles, consisting of woody tissue containing spiral or other vessels, the whole imbedded in the cellular system.

In comparative anatomy, the circulatory system. A term applied to the whole series of vessels — arteries, veins, lymphatics, and lacteals — directly or indirectly connected with the circulation of the blood. The vessels of which it is composed are of two leading types — those which carry blood, and those carrying lymph or chyle. The first constitute the sanguiferous system, and include the heart, the arteries, the capillaries, and the veins. The second or absorbent system includes the smaller and larger lymphatic and lacteal vessels, with the lymphatic and mesenteric glands.

**Vase,** a vessel of various forms and materials, applied to the purposes of domestic life, sacrificial uses, etc. They were often used merely for ornament, or were at least primarily ornamental in character and design. The antique vases found in great numbers in ancient tombs and catacombs in Etruria, Southern Italy, Greece, Sicily, etc., and used to contain the ashes of the dead,



GRECIAN VASES.

were for the most part made of baked clay, painted and glazed, though by the Egyptians, Greeks and Ottomans other materials, such as precious stones, gold, silver, bronze, ivory, and glass were used. One form of vase seems to have been peculiar in Etruria

CHINESE, JAPANESE, AND INDIAN VASES.

— viz., black or red vessels, with figures in relief upon them. A favorite kind of vase, introduced into Rome by Pompey, was called Murrhine. Another kind was the cameo vase, made of two layers of glass, the outer of which was opaque, and was cut down so as to leave figures standing out upon the lower layer as a ground. To this class belongs the celebrated Portland Vase in the British Museum. The glass vases of Venice became famous in the beginning of the 16th century, and in the same and following centuries many vases of the highest artistic performance were produced in Italy, France, and Germany. The porcelain vases of China and Japan are also characterized by great elegance of form and beauty of ornamentation.

**Vaseline,** or **Vaselene,** petroleum jelly, a pale yellow, translucent, semi-solid substance, consisting of a mixture of the hydrocarbons $C_{16}H_{34}$ and $C_{20}H_{42}$, obtained by treating the undistilled portion of petroleum with superheated steam, and filtering while hot through animal charcoal. It is insoluble in water, very slightly soluble in alcohol, but dissolves freely in ether, chloroform, benzine,

and turpentine, is miscible in all proportions with fixed and volatile oils, melts at 35°-40°, and commences to fume at 160°. Its density in the melted state is .840–.866. Pure vaseline does not turn rancid on exposure to the air, a property which renders it a valuable substitute for lard, etc., in the preparation of ointments liable to change. It is also said to possess curative powers of its own.

**Vasey, George,** an English botanist; born near Scarborough, England, Feb. 28, 1822. He became connected with the Department of Agriculture at Washington. His published works include: "The Philosophy of Laughing and Smiling"; "Descriptive Catalogue of the Native Forest Trees of the United States" (1876); "The Grasses of the United States" (1883); "Descriptive Catalogue of the Grasses of the United States" (1885); and "Grasses of the South" (1887). He died in 1893.

**Vasfi, Kéfévi, Sheik** (väs'fē), a contemporary Turkish poet, critic, and littérateur of considerable repute in his own country. Besides numerous translations of philosophical maxims, moral anecdotes, etc., from the Arabic and Persian, he has written two volumes of original poems, "Djézébaad" and "Feïzabad," which are imbued with the Oriental mysticism.

**Vasili, Compte Paul,** a pseudonym of Madame Emond Adam. See ADAM, JULIETTE.

**Vaso-constrictor,** in anatomy, a term applied to nerves, the stimulation of which always causes constriction. Such are the vaso-motor fibers of the cervical, sympathetic, and splanchnic nerves.

**Vaso-dentine,** that modification of dentine in which the capillary tracts of the primitive vascular pulp remain uncalcified, and carry red blood into the substance of the tissue. They form the so-called vascular or medullary canals, and are usually more or less parallel in their course. Vaso-dentine occurs in large amount in the central part of the tooth of the sloth and megatherium, in smaller amount in the teeth of the elephant and the incisors of the Rodentia.

**Vaso-motor,** or **Vaso-motorial,** a term applied to nerves which govern the motions of the blood-vessels. Quain says that the term is a convenient one, but does not consider that the nerves thus indicated constitute a distinct system. Used also of the operation of those nerves.

**Vassar College,** an American institution of learning, established by Matthew Vassar in Poughkeepsie, N. Y., in 1861, for the higher education of women. The first donation was $428,000 for buildings and furnishings. This amount was increased by a bequest of $360,000. Later Matthew Vassar, Jr., gave the institution $130,000 and John Guy Vassar, $444,000. There have since been large donations from other persons. The campus, which contains 210 acres, is 3 miles from the Hudson river, and is mostly laid out as a park. In its course of study the institution is on a par with the highest-grade colleges in the United States, no student being admitted without a full preparatory course. The college has an endowment of about $1,000,000; grounds and buildings valued at over $2,500,000; scientific apparatus, etc., $65,000; volumes in the library, 66,000; average number of faculty, 100; average student attendance, 1,050; graduates, over 3,400; ordinary income, about $850,000.

**Vassar, John Guy,** an American philanthropist, nephew of Matthew Vassar the founder of Vassar College; born in Poughkeepsie, N. Y., June 15, 1811. He was one of the trustees of Vassar College; traveled extensively, and wrote: "Twenty Years around the World" (1861). He died in Poughkeepsie, Oct. 27, 1888.

**Vassar, Matthew,** an American philanthropist; born in Norfolk co., England, April 29, 1792. He emigrated to the United States, where he accumulated a large fortune. In 1861 he gave $428,000 to found VASSAR COLLEGE (*q. v.*). He died while reading an address to the trustees of the college, June 23, 1868. By his will he left over $400,000 additional to the institution.

**Vateria,** a genus of *Dipteraceæ*. Calyx five-cleft, with the segments at length reflexed; petals five, emarginate; stamens 40 to 50, with short filaments and long linear anthers; fruit capsular, three-valved, one-celled, one-seeded. *V. indica* is a large evergreen tree, 60 feet high, with whitish bark, growing in India in the Western Ghauts up to the height of 4,000 feet. The seed yields a white or pale yellow solid and concrete fat burnt in lamps and used in the manufacture of candles and soap. When the tree itself is wounded there flows from it a resin constituting the white dammar, piney-resin or varnish, or Indian copal.

**Vatican, The,** the most extensive palace in the world, and, as the residence of the Pope, and the storehouse of valuable literary and art collections, one of the chief attractions of modern Rome. A building of the kind was erected on the Mons Vaticanus by Pope Symmachus about the year 300, near the anterior court of old St. Peter's, and it was rebuilt by Eugene III. and enlarged by Nicholas III. The Vatican did not, however, supersede the Lateran as the usual residence of the Popes till their return from Avignon in 1377. The first conclave, held in 1378, resulted in the so-called Western Schism. In 1450 Nicholas V., with the object of making the Vatican the most imposing of palaces, began the work of com-

bining with it the residences and offices of the cardinals, and the small portion completed by him, afterward occupied by Alexander VI., and named Tor di Borgia, was extended by subsequent Popes. The Sixtine Chapel was erected by Sixtus IV. in 1473, and the Belvedere or garden house by Innocent VIII. in 1490. Bramante, under Julius II., united the latter with the palace by means of a great court, and constructed the Loggie round the Cortile die S. Damaso. By the erection of the library Sixtus V. divided Bramante's great court into two parts, the anterior court and Giardino della Pigna. The Pauline Chapel was the work of Paul III. (1534), and the present residence of the Popes was completed by Clement VIII. (1592–1605). The labor of extending and adorning the Vatican was continued by Urban VIII., Pius VII., and Gregory XVI.; and even Pius IX., amid the revolutionary struggles of the 19th century, found time to enclose the fourth side of the Cortile di Damaso by reconstructing the great staircase forming the approach from the colonnade of St. Peter's. The palace now comprises 20 courts and some 11,000 halls, chapels, saloons, and private apartments. Chief among its great art treasures are the Sistine frescoes of Michael Angelo and Raphael's Stanze and Loggie. The picture gallery is one of the richest in Rome, and the collection of antiquities is the finest in the world, including extensive Egyptian and Etruscan museums, and comprising among its classical sculptures the Torso of Hercules, the Laocoon, and the Apollo Belvedere. The library now contains nearly 25,000 MSS., of which 17,400 are Latin, 3,450 Greek, and 2,000 Oriental; it also contains about 50,000 printed books, but of these only what formerly constituted the library of Cardinal Maï is catalogued and available for consultation. The archives are specially rich in documents relating to the Middle Ages, and comprise registers of the papal acts, letters of Popes from Innocent III. down to Sixtus V. in 2,016 volumes, correspondence from nuncios and foreign nations, etc. The privilege of studying in the art galleries, curtailed since 1870, was extended by Leo XIII. in December, 1878.

**Vatican Council,** the First Council of the Vatican, or the Nineteenth General Council, which assembled on Dec. 8, 1869. At the opening sitting 719 prelates were present, and the number rose in the following year to 764. The work done consisted of two constitutions — one, "Of the Catholic Faith," treating of the primary truths of natural religion, revelation, faith, and the connection between faith and reason; the other, "Of the Church of Christ," treating of the primacy of the Roman See, and defining the papal claims to authority over all Christians. The first constitution was unanimously accepted in a session of 667 prelates, and confirmed by the Pope (Pius IX.) on April 20, 1870. The second constitution led to a long discussion; on May 13 the scheme, with the added clauses on Papal Infallibility, was laid before the Council, and on July 18 the bull *Pastor Æternus,* containing the constitution and the definition of Papal Infallibility, was read; 525 prelates voted in favor of it, two voted against it, while several absented themselves from the public session. The decree was then confirmed by the Pope. On the same day Napoleon III. declared war against Prussia; on Sept. 20 the Italian royalists took possession of Rome, and on Oct. 20 the Pope prorogued the Council, which has never reassembled.

**Vatke, Johann Karl Wilhelm** (vät'ke), a German theologian; born in Behndorf, near Madgeburg, March 14, 1806; habilitated at Berlin as privat docent in theology in 1830; appointed professor extraordinary in 1837. His works were: "The Religion of the Old Testament" (1835) "Human Freedom" (1841); "Introduction to the Old Testament" (1886); and "Philosophy of Religion" (1888). He grasped the idea of the post-exilic origin of the priestly code in the Pentateuch as early as Graf, but the names of both have paled before those of Kuenen and Wellhausen. He died in Berlin, April 18, 1882.

**Vattel, Emerich** (vä-tel'), a Swiss publicist and jurist; born in Couvet, Neuchâtel, Switzerland, April 25, 1714. His great work is "The Law of Nations; or, Principles of the Law of Nature applied to the Affairs of Nations and Sovereigns" (2 vols. 1758). He wrote also: "Philosophical Leisure Hours" (1747); "Literary, Moral and Political Miscellanies" (1757); "Questions of Natural Right; or, Observations on Wolf's Treatise on the Law of Nature" (1762). He died Dec. 28, 1767.

**Vauban, Sébastien le Prestre de,** a military engineer and Marshal of France; born in Saint Léger du Fougeret, Burgundy, May 15, 1633. Left a destitute orphan at 10 he was brought up by the village curé, and at 17 enlisted in the regiment of Condé, then in league with Spain against the king. Taken prisoner in 1653, he was persuaded by Mazarin to take service under the king, and in 1655 he received his commission as one of the royal engineers. Already in 1658 he had the chief direction of the attacks made by Turenne's army, and the eight years of peace that followed this campaign he devoted to works at Dunkirk and elsewhere. In 1667 he helped to reduce Lille, and next was appointed governor of its new citadel. During the campaigns in Holland (1672–1678) he took part in 17

sieges and one defense, rising to be brigadier and major-general, and at the close commissary-general of fortifications. He first introduced the method of approach by parallels at the siege of Maestricht (1673), and with such effect that that strong fortress capitulated in 13 days. The rest of his more famous exploits in these campaigns were the triumphant defense of Oudenarde and the sieges of Valenciennes and Cambrai.

SÉBASTIEN VAUBAN.

During the 10 years of peace which followed 1678 Vauban rendered to France perhaps the greatest of his services, in surrounding the kingdom with a complete cordon of fortresses, and he planned and partly executed the magnificent aqueduct of Maintenon, by which the waters of the Eure are conveyed to Versailles. In 1703 he rose to be Marshal of France.

War breaking out again in 1688, Vauban conducted with his usual success the sieges of Philipsburg — introducing here his invention of ricochet batteries — Mannheim, Mons (1691), and Namur (1692). The sieges of Charleroi (1693), Ath (1697), Briesach (1704), and the construction of the entrenched camp near Dunkirk (1706) are the only professional works of importance during the last 14 years of his life. After the peace of Ryswick in 1697 he had applied his active mind to the consideration of various faults in the internal government of France, and he had observed the fatal consequences of the Revocation of 1685. His ideas he submitted in a memoir to Louvois and Madame de Maintenon in 1686. But another work, the "Royal Tithe" (1707), in which he discussed the question of taxation, and anticipated in the most striking manner the doctrines which 80 years later overthrew the French monarchy, brought down a heavier storm on his head. Saint-Simon tells us the book was clear, simple, and exact, but the truths it told were unpalatably plain. In 1699 and again in 1704 he had sent it to the king, but no notice was taken till in 1706 he began privately to print 300 copies, whereupon the book was at once condemned. Vauban did not long survive the disgrace, dying in Paris, March 30, 1707. "I have lost a man very devoted to my person and to the State," said his self-complacent master. His body was buried at Bazoches; in 1806 Napoleon deposited his heart in the Invalides.

Saint-Simon describes Vauban as "perhaps the most honest and most virtuous man of his age . . . never was man more gentle, more kindly, or more obliging." Of middle height, hardy frame, blunt manners, sound judgment, and indomitable courage, he never experienced a reverse, yet all his success never turned his head or impaired his modesty. He conducted 50 successful sieges, and designed or improved the works of more than 160 fortresses, among them Dunkirk, Landau, Lille, and Strasburg. He it was, and not Mackay, who in 1687 invented the socket instead of the plug bayonet.

**Vaucheria** (named after Rev. M. Vaucher of Geneva, a botanical author, who died in 1841), the typical genus of *Vaucherieæ;* green-spored algæ, with fronds, or filaments, aggregated capillary; with an internal green mass. Fructification consisting of short lateral curved antheridia, and cysts containing a single zoöspore of a dark-green color. The species occur in ponds, ditches, damp ground, and the mud of saline streams or seashores.

**Vaucherieæ,** a sub-order or tribe of *Fucaeæ.* Frond with one or more siphons, without bark; utricles forming a lateral branchlet, proceeding from the upper, or more rarely from the lowest, joint of the branch. It contains the following families or tribes: *Hydrogastridæ, Dasycladidæ, Ectocarpidæ, Batrachospermidæ,* and *Chordaridæ.*

**Vaucluse** (vō-klüz′), a department in the S. E. of France; bounded on the W. by the Rhone, and on the S. separated by the

Durance from Bouches du Rhone; area, 1,370 square miles; pop. (1906) 239,178. The E. is intersected by spurs of the Alps; in the W. are plains. Agriculture is the chief occupation; of late oaks have been largely planted for the culture of truffles; and there are manufactures of silk, wool, pottery, chemicals, etc. Originally composed of the county of Venaissin, the principality of Orange, and part of Provence, the department is divided into the four departments of Apt, Avignon, Carpentras, and Orange, Avignon being the capital. The village of Vancluse (*Vallis clausa*) stands in a romantic ravine 19 miles E. of Avignon, and is noted as having been for 16 years the residence of Petrarch, and for its famous fountain. Here, too, lived John Stuart Mill.

**Vaud** (vō) (German, Waadt), a canton which forms the W. corner of Switzerland; between the Jura and the Bernese Alps; area, 1,244 square miles; pop. (1908) 307,218. It is a comparatively level district, traversed, however, by an elevated tract known as Mount Jorat, from which plains slope on either side to the Lake of Geneva on the S. and the Lake of Neufchâtel on the N. On both sides, near the mountains, there are extensive pasture lands, but the greater part of the country is highly cultivated. The vineyards yield white wines of excellent quality. Vaud forms part of French Switzerland; the religion is Protestant. After the fall of the Roman empire it belonged to the Burgundian kingdom, but in the 13th century it became a dependency of Savoy, and in 1536 the Bernese took possession of it. The French invasion put an end to the rule of Bern, and Vaud became a separate canton. The existing democratic representative constitution dates from 1845. Lausanne is the capital. See SWITZERLAND: WALDENSES.

**Vaudeville** (vōd'vēl), a term originally applied to a country song of like kind with those written by Oliver Basselin, of the valleys of Vaux de Vire, in Normandy, in the 15th century. These songs, which were satirical, had for their subjects love, drinking, and passing events. They became very popular and were spread all over France under the name *Lais des Vaux de Vire*. The peculiarity of their character lived after their origin was forgotten, and plays, interspersed with songs of this description, came to be called Vaudevilles, and occasionally Virelais. Also a light gay song, frequently embodying a satire, consisting of several couplets and refrain burden, sung to a familiar air, and often introduced into theatrical pieces; a ballad, a topical song. In French drama a piece whose dialogue is intermingled with light or comic songs sung to popular airs. In the United States of late years the term has come into use to denote light or "variety" theatrical entertainments, especially when continuous.

**Vaudoncourt, Baron François Guillaume de** (vō-dôn*g*-kör'), a French general and military writer; born in Vienna, Sept. 24, 1772. His works comprise: "History of the Campaigns of Hannibal in Italy" (1812); histories of Napoleon's campaigns in Russia, Germany, and Italy; and "Fifteen Years of Exile" (4 vols. 1835). He died in Passy near Paris, May 2, 1845.

**Vaughan, Charles John** (vân), an English clergyman and religious writer; born in Leicester, England, in 1816. He was head-master of Harrow, 1844–1859; Master of the Temple, 1869–1894; chaplain in ordinary to the queen. Among his many works are: "Memorials of Harrow Sundays" (1859); "Sundays in the Temple" (1871); "Heroes of Faith" (1876), lectures; "Temple Sermons" (1881); "University Sermons" (1888); single sermons, addresses, pamphlets, etc. He died in Llandaff, Wales, Oct. 15, 1897.

**Vaughan, Henry,** a Welsh poet, styled "the Silurist" from his having been born among the Silures of South Wales; born in Newton, Brecknockshire, in 1621. He entered Jesus College, Oxford, in 1638, and shared the loyalty of his family, though apparently he did not actually bear arms in the cause. Early a devoted admirer of Ben Jonson, Randolph, and other poets of the day, in 1646 he published at London his first "Poems, with the tenth Satyre of Juvenal Englished." He then studied medicine, became an M. D., and retired to practise first at, and then near, Brecon. The collection of poems entitled "Swan of the Usk" was sent to his brother at Oxford, and was published by him without authority in 1651. About this time a long and dangerous illness deepened his religious convictions, and henceforward the themes of all verse are the littleness of time and the greatness of eternity, the sinfulness of sin, the death and saving grace of Christ. In 1650 he printed at London his "Sparks from the Flint-stone," a collection of pious meditations after the model of Herbert (second part printed with it in 1655), and followed it up in 1652 with "The Mount of Olives," a little book of devotions in prose, and the "Flores Solitudinis," also in prose. Not till the year 1678 was another collection of his verse published, and this time again by a zealous Oxford friend ("J. W.") without his concurrence. This was the "Thalia Rediviva: the pastimes and diversions of a Country Muse," a collection of elegies, translations, etc., of all periods of his life, closing with a few religious pieces ("Pious Thoughts and Ejaculations"), and a pastoral elegy on the death of his brother

Thomas. He died April 23, 1695. Vaughan's poetry is very unequal — his vein seems to have been a flinty soil, from which the right Promethean fire could be struck but now and then. At his best he reaches an exquisiteness of phantasy and of expression beyond the reach of Herbert, but by far the larger part of his poetry, and indeed of almost every poem, sings below that more popular poet's usual level. "The Retreat," "Childhood," and especially "Departed Friends," are some of the rarest flowers in the whole garden of our sacred verse, and atone for much uncouthness, obscurity, and prose. The first of these has been claimed as the prototype of Wordsworth's greater "Ode," and it certainly supplies a dim hint of its fundamental thought.

**Vaughan, Herbert,** a Roman Catholic archbishop of Westminster; born in Gloucester, England, April 15, 1832; the eldest son of Lieutenant-Colonel Vaughan. Educated at Stonyhurst and on the Continent, he entered the priesthood, and in 1872 was consecrated bishop of Salford, in 1892 succeeded Cardinal Manning as Archbishop of Westminster, himself shortly after being raised to the cardinalate. He was an eloquent preacher, the founder of St. Joseph's College for foreign missions at Mill Hill, Hendon, and proprietor of the "Tablet" and the "Dublin Review." Died in 1903.

**Vaughan, Robert,** an English clergyman and historian; born in 1795. He was a Professor of History in London University; president of the Lancashire Independent College, Manchester, 1842–1857; and originator and for 20 years editor of the "British Quarterly Review." He published several important historical works, among which are: "Life of John de Wycliffe" (2 vols. 1828); "The Protectorate of Cromwell" (1838); "History of England under the House of Stuart" (2 vols. 1840); "The Age of Great Cities" (1842); "Revolutions in English History" (1859–1860). He died in Torquay, June 15, 1868.

**Vaughan, Victor Clarence,** an American physician; born in Mount Airy, Mo., Oct. 27, 1851; was graduated at Mount Pleasant College, Huntsville, Mo., in 1872, and at the Medical Department of the University of Michigan in 1875; became an instructor in the university in 1876; professor in 1880; and dean of the Department of Medicine and Surgery in 1890. During the Santiago campaign of 1898 he was surgeon of the 33d Michigan Volunteer Infantry. He was made division surgeon in the same year. In 1900 he became surgeon-general of the American-Spanish War Veterans. His publications include "Osteology and Myology of the Domestic Fowl" (1876); "Text-book of Physiological Chemistry"; "Ptomaines and Leucomaines" (with Dr. Novy); and over 100 professional papers.

**Vault,** an arched roof; a concave roof, or roof-like covering, hence applied figuratively to the sky. In architecture, an extended arch covering an apartment so constructed that the stones, bricks, or other material of which it is composed sustain and keep each other in their places. Vaults are of various kinds; a cylindrical vault has a semi-circular arch; a covered vault has an arch which springs from all sides of its plan; a groined vault is one formed by two vaults intersecting at right angles. When a vault is of greater height than half its span, it is said to be surmounted, and when of less height surbased. A rampant vault is one which springs from planes not parallel to the horizon; the vault placed over another constitutes a double vault. A conic vault is formed of part of the surface of a cone, and a spherical vault of part of the surface of a sphere. A vault is simple when it is formed by the surface of some regular solid, and compound when compounded of more than one surface of the same solid, or of two different solids.

**Vaulting Monkey,** the *Cercopithecus petaurista,* from the W. coast of Africa; head and body about 15 inches long, tail nearly two feet. Fur darker above, lighter below; fringe of white hair round face; white spot on nose, whence it is often called white-nose, or white-nose monkey. It is a graceful little creature, and extremely playful, and the agility with which it passes from bough to bough justifies its specific and popular name.

**Vauqueline,** or **Vauquelinite** (after M. Vaquelin, the discoverer of chromium), in chemistry, (of the form, Vauqueline): Pelletier and Caventou's original name for strychnine. In mineralogy (of both forms), a monoclinic mineral occurring in minute crystals, also botryoidal and granular; hardness, 2.5–3; sp. gr., 5.5–5.78; luster, adamantine to resinous, becoming dull on exposure; color, shades of green and brown to nearly black; streak, greenish or brownish; somewhat brittle. An analysis by Berzelius yielded: Chromic acid, 28.33: protoxide of lead, 60.87; protoxide of copper, 10.80 = 100, corresponding with the formula $(CuO\ PbO)_3 2CrO_3$, which requires, chromic acid, 27.7; protoxide of lead, 61.4; protoxide of copper, 10.9.

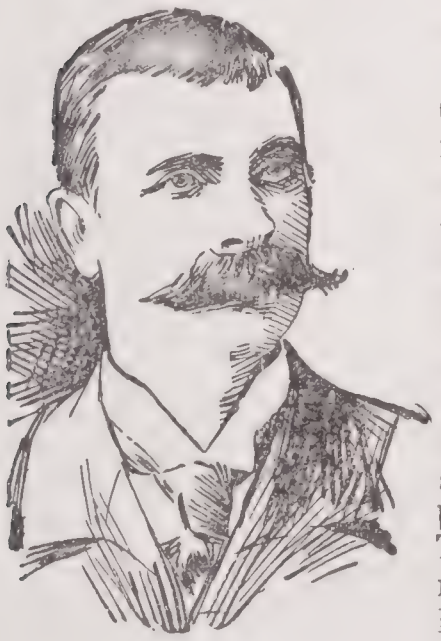
**Vaux.** See FAWKES.

**Vaux, Calvert,** an American landscape architect; born in London, England, Dec. 20, 1824; came to the United States in 1848, and formed a partnership with Andrew J. Downing, with whom he laid out the grounds surrounding the National Capitol and the Smithsonian Institution. Afterward in conjunction with Frederick Law Olmstead

he made plans for the laying out of Central Park, New York city, and Prospect Park, Brooklyn, N. Y. He also planned parks for Chicago, Buffalo, Newark, N. J., and other cities, and laid out the State Reservation at Niagara Falls. He became landscape architect of the Department of Public Parks of New York city, and was attached to the Consolidated Commission of Greater New York. He died in Bensonhurst, L. I., Nov. 19, 1895.

**Vaux, Richard,** an American penalogist; born in Philadelphia, Pa., Dec. 19, 1816; was admitted to the bar in 1836, and for a year was secretary of the American legation in London. He was then sent to Brussels to aid in the reorganization of the American legation; returned to London, and for a time was private secretary of United States Minister Stevenson. He was recorder of deeds in Philadelphia in 1842–1849. He became widely known by his publication, "Recorder's Decisions" (1845). Not a single decision of his was ever reversed by a higher court. He was appointed an inspector of the Eastern Penitentiary in 1843, and for more than 50 years prepared its annual reports. He was elected mayor of Philadelphia on the Democratic ticket in 1855. He became one of the chief penalogists of the United States, and on that subject lectured and prepared a large number of publications. He died in Philadelphia, Pa., March 22, 1895.

**Vazoff, Ivan** (vä'zof), a Bulgarian author; born in Sopot in 1850. Besides numerous poems, he wrote "Under the Yoke" and other widely read novels.



IVAN VAZOFF.

**Veader, Veadar** (-ā'dur), a supplementary month added by the later Jews sometimes after the third, sometimes after the 2d sacred year, care being taken that the 7th year should have no such month appended to Adar. The 12th sacred month ended in February or March, and Veadar, if introduced, immediately followed. This was the method of adjusting the Hebrew months which were lunar to the solar year.

**Vector,** in mathematics, the same as RADIUS VECTOR (*q. v.*). Also a directive quantity as a straight line, a force, or a velocity. The simplest manner in which to represent such a quantity, which involves both direction and magnitude, is by means of a straight line in space. Then the vector may be regarded as a stepping from one extremity of the line to the other. Vectors are said to be equal when their direction is the same and their magnitudes equal.

**Veda** (from *vid,* "to know," hence "knowledge, [sacred] science"), the name of a body of religious writings which the Hindus believe to be divinely inspired. This body primarily consists of four collections (*samhitâ*) of hymns, detached verses, and sacrificial formulas — viz., the Rig Veda, or Veda or praises or hymns; the Sâma Veda, or Veda of chants or tunes; the Yajur Veda, or Veda of prayers; and the Atharva Veda, or Veda of the Atharvans — to each of which are attached certain theological prose works called Brâhmana, and intended chiefly to elucidate the meaning and application of the sacred texts, especially from a sacrificial point of view. The first three Vedas are often referred to as the "trayî vidyâ," or threefold science; and they alone must originally have formed the sacred canon, while the fourth Veda, which is less archaic in language, was not recognized till a later period. The Samhitâs of the Sâma Veda and Yajur Veda are of a purely sacrificial and professional character, being intended to serve as text-books for two of the four chief classes of priests — viz., the chanters (Udgâtar) and the offering priests (Adhvaryu) respectively; and the verses contained in them are to a large extent taken from the Riksamhitâ, though not unfrequently with considerable textual variations. The Riksamhitâ, on the other hand, though likewise assigned to a special class of priests — viz., the invokers (or sacrificers, Hotar), is not a sacrificial text-book in the same narrow sense of the word; but it has rather to be looked on as a collection of all the sacred poetry which was within reach of the collectors, and seemed to them worthy of being preserved for devotional purposes. The hymns recited by the Hotar at the sacrifices were, however, drawn almost exclusively from this collection, the study of which was therefore especially incumbent on him. The fourth class of priests, the Brahmans, whose function it was to superintend the entire sacrificial performance, had not, and could not from the very nature of their office have, any special text-book assigned to them; and it was doubtless from mere theoretic considerations that the Atharva Veda came ultimately to be regarded as specially connected with the Brahman priest.

More or less closely connected with the Brâhmanas are two classes of works — viz., the Âranyakas, or forest treatises, so called from the recondite nature of their subjects,

which it required an anchorite's seclusion to study adequately; and the Upanishads, or secret doctrine, treating of the nature of the Brahman, or supreme spirit. The gradual elaboration of the sacrificial system also at length gave rise to ceremonial manuals, composed in the form of strings of concise rules (sûtra). These Kalpasûtras usually consist of two parts — viz., S'rautasûtras and Grihyasûtras, dealing with the great Vedic sacrifices and the ordinary domestic offerings and ceremonies respectively. In course of time the oral transmission of the canonical scriptures led to more or less serious discrepancies, as regards both the order of arrangement and textual readings, which gave rise to different schools recognizing different recensions (s'âknâ, literally "branch") of the sacred texts. The number of such different versions was at one time very considerable, especially in the Sâma Veda and Yajur Veda; but only a few of them have been preserved.

The Rig Veda samhitâ has come down to us in a single recension, that of the S'âkala school. It consists of 1,028 hymns, composed in various meters, and arranged in 10 books, or mandalas. Book i. is mainly made up of 16 collections of hymns ascribed to as many poets belonging to different families. Books ii.–vii., on the other hand, are attributed each to a special family of Rishis or seers — viz., the Gritsamadas, Kus'ikas (or Vis'vâmitras), Vâmadevyas, Aatris, Bharadvâjas, and Vasishthas respectively — whence they are usually called the family books. In the several collections of these seven books the hymns are arranged according to the deities to whom they are addressed — viz., Agni (god of fire), Indra (god of the sky), followed by minor deities. Book viii. consists mainly of hymns adapted for chanting, and for the most part belonging to the Kânva family of seers. Book ix. is made up exclusively of hymns addressed to Soma, the deified power of the intoxicating juice of the soma plant, and used for recitation at the Soma sacrifice (see Soma). Book x., consisting like the first of 191 hymns, has the appearance of an appendage, containing for the most part hymns of later origin, though also doubtless including not a few genuine old hymns which had probably escaped the attention of the original collectors. The date at which the hymns were collected may be approximately fixed at 1000 B. C., while the composition of the earlier hymns would probably go back several centuries before that period. The Vedic Aryans, as pictured in the hymns of the Rik, were scattered in numerous clans over the Punjab and adjoining districts W. of the Indus. Their religion was mainly a worship of the powers and phenomena of nature; the favorite deities being Indra, forever battling with the demons of darkness and drought; Agni (ignis), the genial inmate of the human dwelling in the shape of the household fire; Ushas (aurora), the fair awakener of the daily life; Soma; and Varuna ( *οὐρανος* ), the stern and ever-wakeful guardian of the sacred ordinances.

The Brâhmana of this Veda has been handed down in two distinct versions differing considerably, especially in their arrangement of the common matter — viz., the Aitareya-brâhmana (translated by M. Haug) of the school of the Aitareyins; and the Kaushîtaki or S'ânkhâyana)-brâhmana of the Kaushîtakins. The work deals exclusively with the various forms of Soma sacrifice, and the consecration of the king. Each of the two schools has also its own Âranyaka — the Aitareyâranyaka and Kaushîtaki-âranyaka — certain portions of which are styled Upanishads. Similarly there are two complete sets of ceremonial rules or Kalpasûtras, ascribed to Âs'valâyana ( ? 4th or 5th century B. C. ) and S'ânkhâyana respectively.

The Sâma Veda-samhitâ consists of two parts (or ârchika), the first of which contains the (585) verses to which the several sâman tunes are usually sung, while the second gives the text of the made-up chants in the order in which they are required in the sacrificial ritual. The tunes themselves on the other hand, are given in four special tune-books, called Gâna, attached to the Samhitâ. The latter, consisting as it does mainly of detached verses taken from the Riksamhitâ, has only a technical interest. The mode of chanting somewhat resembled the Gregorian or Plain chant. The Brâhmanas of this Veda have a special character of their own, inasmuch as they are not different versions, or editions, of the same traditional exegetic and legendary matter, but altogether distinct treatises, dealing chiefly with chants. Nine such works are hitherto known, the most important of which are the Tândya-brâhmana, also called Panchavims'a, consisting as it does "of 25 chapters"; the Shadvims'a-br., or "26th"; the Chhândogya-br., including the Chhândogyopanishad (translated Röer, F. Max Müller); and the Jaiminîya- or Talavakâra-br., of which the interesting Kenaupanishad (translated Röer; F. Max Müller), on the nature of the Brahman, forms part. There are also several ceremonial Sûtra works connected with this Veda, among which may be mentioned the S'rautasûtra of Lâtyâyana and the Grihyasûtra of Gobhila.

The Yajur Veda offers the spectacle of a complete schism, its teachers and followers dividing themselves into an older and a younger branch, or the Black and the White Yajur Veda, so called from the form in which

their canonical books were handed down. For while the scriptures of the older branch presented a somewhat confused appearance, caused by the constant intermingling of the sacrificial formulas (yajus) and the exegetic portions (brâhmana), the younger school adopted the practice of the followers of the Rik by dividing their scriptures into a regular Samhitâ, or collection of sacrificial formulas, and a Brâhmana. The older branch became again split up into numerous schools; four different recensions of their texts being so far known to us, the most important of which is the Taittirîya-samhitâ, with an appendix called Taittirîya-brâhmana, though characterized by the same motley intermixture of textual and exegetic matter. There is further a Taittirîyâranyaka, part of which constitutes the Taittirîyopanishad (translated Röer; F. Max Müller). Of the Sûtra works of the older schools several have come down to us, at least in part, the most complete being the Âpastamba-Kalpasûtra. Of the texts of the White Yagus — viz., the Vâgasaneyi-samhitâ, and the S'atapatha-brâhmana, or Brâhmana of 100 paths (books i.–vii. trans. by J. Eggeling), which includes the Brihadâranyaka, the recensions of two different schools are so far known to us — viz., the Mâdhyandinas and Kânvas, both of which recognized a common set of ceremonial rules, the S'rautasûtra of Kâtyâyana and the Kâtîya-Grihyasûtra of Pâraskara.

The Atharva Veda-samhitâ is a collection of hymns and spells which, in importance and interest, ranks next to the Riksamhitâ. The two collections present two different aspects of the religious belief of the ancient Hindus. While the Rik reflects a simple belief in divine powers who are, on the whole, well disposed toward the Aryan man, and whose favor the worshiper is confident of gaining by his song, the Atharvan, on the other hand, reveals a superstitious dread of a host of malevolent powers, the effects of whose ill will man seeks to avert by means of incantations and magic practices. As the language of the Atharvan presents a more modern appearance than the main body of the Rik, the marked change in the religious spirit of the people may perhaps be due to contact and intermixture with non-Aryan tribes. It is not impossible, however, that superstitious rites of the kind favored in the Atharvan had long been practised by the Aryan people, though they found no expression in the devotional lyrics approved by the priests. The Samhitâ, which is traditionally connected with the priestly families of the Atharvans and Angiras, is divided into 20 books, the last two of which are, however, later additions. The ordinary text of Northern India is usually ascribed to the S'aunaka school. A new recension lately discovered in Kashmir not only differs from it considerably in its arrangement, but also contains some new matter, amounting to about one-sixth of the whole. The Brâhmana of this Veda, the Gopatha (or cow-path)-brâhmana, containing cosmogonic speculations and explanations of certain sacrificial rites, is probably a comparatively modern work; while of the two ceremonial sûtras, the Vaitâna (or s'rauta)-sûtra and the Kaus'ika-sûtra, a manual of domestic rites, the latter is by far the more interesting. The Atharva Veda has also usually assigned to it a large number of Upanishads, amounting to considerably over 100. They are evidently of various ages, many of them coming down to very recent times.

**Veda, Land of the.** See LAND OF THE VEDA.

**Vedah,** or **Veddah,** a tribe inhabiting the forests of the interior of Ceylon, probably either the aborigines, or outcasts from the Singhalese. They live in a primitive state, ruled by their own chiefs, and conceal their villages in the depths of the jungle, as far as possible from the beaten paths. Their language differs but little from the common Singhalese.

**Vedangas,** what the Brahmans call "members of the Veda." They are six in number, but this name, says Max Müller ("Ancient Sanskrit Literature," p. 109), "does not imply the existence of six books or treatises intimately connected with their sacred writings, but merely the admission of six subjects, the study of which was necessary either for the reading, the understanding, or the proper sacrificial employment of the Veda." The six subjects or doctrines usually comprehended under the name Vedangas are: Sikshâ (=pronounciation), Chhandas (=meter), Vyâkarana (=grammar), Nirukta (=explanation of words), Jyotisha (=astronomy), and Kalpa (=ceremonial). The first two are considered necessary for reading the Veda, the two next for understanding it, and the last two for employing at sacrifices. The writers of the Vedangas do not claim inspiration.

**Vedanta,** in India, a system of religion and philosophy professedly founded on the Vedas. It is divided into the Pûrva mimânsa and the Uttara mimânsa, or the former and the latter mimânsas, which constitutes two of the leading darsanas or schools of philosophy. As the first of these is chiefly practical, the Vedanta philosophy is mainly derived from the second. It was founded by Vyasa, and was modified by Sankara, its commentator. The former identified the world with God, and contended earnestly for the reality of the external universe which he held to have been created

by God; the later Vedantists maintained that the universe is but an illusion projected by God, and is itself God. The present Vedanta system is Pantheistic. It has many adherents among the more educated Hindus.

**Vedder, David,** a Scotch poet; born in Burness, Orkney, in 1790; was in early life a sailor and made several voyages to Greenland; entered the British revenue service; and in 1820 was appointed tide-surveyor of customs — an office which he held successively at Montrose, Kirkcaldy, Dundee, and Leith. He was a votary of the muse from an early age, but his first volume, entitled "The Covenanters' Communion and other Poems," was not published till 1836. His subsequent works are "Orcadian Sketches" (a medley of prose and verse), a "Life of Sir Walter Scott," and "Ballads and Lyrics." In 1841 his collected verse appeared in one volume under the title, "Poems — Legendary, Lyrical, and Descriptive." He was also a contributor to George Thomson's "Musical Miscellany," the "Christian Herald," the "Book of Scottish Song," and the famous "Whistle-Binkie." His verse is marked by spirit and force, and at times has the rare merit of originality. He died in Edinburgh, Feb. 11, 1854.

**Vedder, Elihu,** an American painter; born in New York city, Feb. 26, 1836. He studied at Paris and in Italy, where he ultimately made his residence. His subjects are mostly ideal — "The Lair of the Sea-serpents," "Fisherman and Djin," "Death of Abel," "Greek Actor's Daughter," "Cumean Sibyl," "Nausicaa and her Companions." He also illustrated Edward FitzGerald's "Omar Khayyám" (Boston, 1884).

**Vedder, Henry Clay,** an American historian; born in De Ruyter, N. Y., Feb. 26, 1853; was graduated at the University of Rochester in 1873 and at the Rochester Theological Seminary in 1876; was on the editorial staff of "The Examiner," a Baptist weekly, in 1876–1892; and was its editor in 1892–1894. In the latter year he became Professor of Church History at Crozer Theological Seminary. His publications include "Baptists and Liberty of Conscience" (1885); "The Decline of Infant Baptism" (1890); "A Short History of the Baptists" (1891); "The Higher Criticism" (1892); "Talks with Baptist Young People" (1895); "The Decline of the Apostolic Succession in the Church of England" (1894); "A History of the Baptists of the Middle States"; etc.

**Vega,** or **Wega,** a star of the first magnitude, in the constellation Lyra or Harp; the Alpha Lyræ of astronomers; right ascension 18 hours, 33 minutes, 13 seconds; declination N. 38° 40′ 9″. The name has reference to the eagle or the vulture pictured in some celestial maps, the lyre covering its body. It is between the constellations Hercules on the W. and the Swan on the E.; and is about one-quarter further from the North Star than the star in the end of the handle of the Great Dipper: a straight line from the star at the bottom of the dipper, nearest the handle, running midway between the star at the junction of the handle and the first neighboring one of the handle, would strike Vega if prolonged one-quarter of the whole circle of the heavens — *i. e.,* the heavens both above and below the horizon. Vega forms an almost right-angled triangle with tne stars in the long-arm end and the one in the center of the cross in the Swan, the former of these two stars at the approximately right angle. It comes to the meridian at midnight in the Eastern United States in August, and is at the zenith in the latitude of Washington, D. C., very nearly. Of the seven stars of the first magnitude in the hemisphere, Capella is the brightest and Vega the next. The light of Vega is intensely white; is $\frac{1}{24000}$ that of the full moon, and $\frac{1}{18000000000}$ that of the sun, as reckoned by Dr. Wollaston; yet its radiating power, of light and heat, is estimated by some to be 900 times that of our sun. Its distance from the earth has been variously computed, from 6,000,000 times the distance of the sun to 1,500,000 times. The parallax assigned has decreased as the instruments of observation have improved. Brinkley made it not less than 2″; Airy regarded it as too small to be sensible. Dr. W. L. Elkins of the Yale Observatory, after 1888 made further researches, which led to a value of 0″.10 for the parallax, corresponding to 33 "light years" or 2,000,000 times the sun's distance; and he gave the radiating power as 100 times that of our sun. The spectrum of Vega has comparatively few lines, but those of hydrogen are strong. Like many of the brightest stars, it has a close, faint companion, seen only with telescopes of high power. From the revolution of the celestial equinoctial pole and the pole of the ecliptic, Vega will be within 5 degrees of the N. Pole in about 10,000 years, and hence will be practically the "North star."

**Veeder, Mrs. Emily Elizabeth (Ferris),** an American novelist and verse-writer; born in New York, in 1841. Her home was in St. Louis, Mo., and she wrote: "Her Brother Donnard"; "Entranced"; "The Unexpected"; "In the Garden, and Other Poems."

**Vega Carpio, Lope Felix de,** a Spanish dramatist; born in Madrid, Nov. 25, 1562. The story of Lope's life, as commonly told, is full of confusion. That he lost his parents early, was

Vega Carpio

a student and graduate of Alcalá; a soldier in the Portuguese campaign of 1580, and in the Armada, 1588; secretary to the Duke of Alva, Marquis of Malpica, and Marquis of Sarria; had many amours, was twice married, and father of at least six children, three of them illegitimate; was banished from Madrid because of a quarrel, and lived two years at Valencia; took orders, became an officer of the Inquisition, and died at 73 a victim to hypochondria — all this is indisputable, but the order and relation of the facts are by no means clear. Too much reliance has been placed on his friend and biographer, Perez de Montalvan, who suppresses everything touching his reputation, and, knowing him only in his ascetic days, and being 40 years his junior, was not likely to hear much from him about his love affairs and early adventures. Lope himself, too, increases the confusion by his obscurity and invariable practice of making himself out younger than he was in his reminiscences. Thus he puzzled Schack and Ticknor by giving his age as 15 when he fought against the Portuguese at Terceira, a thing he had no opportunity of doing till he was 20. On Montalvan's authority it is said that on leaving Alcalá he attached himself to the Duke of Alva (*i. e.*, the third duke, the Alva of history), at whose instance he wrote the pastoral romance of the "Arcadia," that soon afterward he married and was banished, and that grief on the death of his wife drove him to join the Armada. But his own words in the "Eclogue to Claudio" and in the "Dorotea" (Act V. sc. viii.) show that it was not the loss of a wife, but trouble with a mistress, Filis, alias Dorotea, that sent him to sea; and that his marriage came later; and abundant evidence, internal and external, proves that the "Arcadia" was written after the Armada, and not for Duke Ferdinand, but for his grandson Antonio, the fifth Duke of Alva. It is, in fact, the story, in a pompous pastoral setting, of the young duke's matrimonial vacillations in 1589–1590, the sober prose version of which may be found in Cabrera's "Felipe Segundo" (part ii.). It must have been soon after this that he married his first wife, Isabel de Urbina, and got into the scrape that drove him to Valencia, for both events are referred to in the "Romancero General," in ballads written at the latest in 1593. He hints at a woman's revenge as the cause of the latter; but in a petition to the king in 1598 he specifies "certain satires against a manager," for which he was sentenced to 10 years' banishment and suffered two, the remainder being remitted.

Tenderness for his name has withheld the mass of his letters to his friend and patron the Duke of Sessa, but a few bearing on this episode were printed in 1876, and it was as well they were, for they dispose of some of the worst imputations against him. He was no hypocrite: he had a conscience, and it troubled him sorely. Out of his own mouth he is proved to have been a miserably weak man with passions too strong for him. A daughter born to him in 1617, to whom he was tenderly attached, as indeed he was to all his miscellaneous offspring, deserted him, it seems, in his old age, and his last years were darkened by sorrow as well as remorse. He took to practices of the severest asceticism, and, sinking at last into what Montalvan describes as a "continued melancholy which of late has been called hypochondria," he died, Aug. 27, 1635. His funeral was more like a prince's than a poet's, and the largest and most illustrious concourse ever seen in Madrid followed his remains along the same street where Cervantes had been carried to his obscure grave on the shoulders of four friars; a contrast, yet not greater than that between the cheerful serenity of the one deathbed and the gloom that lay heavy on the other. He died poor, but not because of his Castilian love of pomp and display, as Sismondi assumes. His large income from his dramas and other sources was all but wholly devoted to charity and Church purposes. His tastes, wants, and habits were of the simplest; a little flower garden a few yards square was his one luxury, and a few books and pictures all his worldly goods.

The mere list of Lope's works presents a picture of unparalleled mental activity from boyhood to old age. He wrote plays, he says, in his 12th year, and certainly wrote some not much later, but his first work of any length was a characteristic attempt in 20 cantos to prove that his was the *miglior plettro* to which Ariosto left the completion of Angelica's story. It was written at sea in 1588, but not printed till 1602. The "Arcadia" was written, as book V. shows, before the Duke of Alva's marriage, July, 1590, but it was kept back till 1598. The "Dragontea," a shout of exultation in 10 cantos over the death of the Dragon, Drake, the destroyer of Spanish naval supremacy, appeared at Valencia the same year, but a few months earlier, and was Lope's first publication with his name. But it was as a ballad writer that he first made his mark. The "Flowers of Romance," the little "garlands" out of which the "General Romances" was formed, had begun to come out at Valencia when he was there in 1590–1592, and of the contributors of the Moorish and pastoral ballads in vogue "Belardo" (his name in the "Arcadia") was, we learn, the most esteemed. Of his miscellaneous works some, like those on St. Isidro and his canonization, and on the marriage of Philip III., are merely occasional, and others owe their escape from utter oblivion solely to his name. The

more notable are the "Rimas" (1602), comprising the "Angelica," 200 sonnets, and a reprint of the "Dragontea"; the "Peregrino in his Country" (Seville, 1604), a romance on the model of "Theagenes and Chariclea," with a preface giving his views on the drama, and a list of the 219 plays he had already produced; the "Conquest of Jerusalem" (1609), an epic in 20 books in competition with Tasso; the "Pastores de Belen" (1612), a religious pastoral; "Filomena" and "Circe" (1621–1624), miscellanies in which he tried to rival the "Novelas" of Cervantes; the "Tragic Crown" (1627), an epic with Mary Stuart for heroine; the "Laurel of Apolo" (1630), a poem on the pattern of Cervantes "Viage del Parnaso"; the "Rimas de Tome de Burguillos" (1634), a collection of his lighter verse, with the "Gatomaquia," a mock-heroic. The most noteworthy of all is the "Dorotea" (1632), in form of a prose drama, but obviously the story of his own early love adventures from 1583 up to a little before the sailing of the Armada, with a prediction from an astrologer of his marriage, imprisonment, and banishment. In all he is credited with 1,500 comedies, of which more than 500 are extant and about 340 are well known.

Lope's plays have been elaborately classified by Schack, Hennig, and others, but for convenience they may be roughly divided into the historical or quasi-historical (including legendary and sacred dramas) and those that deal with everyday life. Of the latter the most characteristic in every way are the "Comedias de capa y espada"—cloak and sword plays — a picturesque title that puts the principal figures before the eye. They are as a rule dramas of upper-class society, in which love, gallantry, jealousy, and above all the hyper-sensitive Spanish honor supply the necessary complications. The "Noche de San Juan," one of Lope's very last plays, the "Maestro de Danzár," one of his first, and the "Azero de Madrid," the source clearly of Molière's "Médecin Malgré Lui," are excellent specimens. It is not easy to make a selection of typical characteristic examples out of a repertory so vast and varied as Lope's, but his peculiarities and excellences as a dramatist may be studied with advantage in such plays as the "Perro del hortelano," the "Desprecio agradecido," the "Estrella de Sevilla," the "Esclava de su Galan," the "Premio del bien hablar"; and no student of Calderon should overlook the "Alcalde de Zalaméa," which, if not better than Calderon's famous play, as Chorley thought it, is unquestionably the bold vigorous outline that left little more than filling in to be done by Calderon's hand, and is one more proof that later dramatists found Lope, as Fuseli said the painters found Blake, "good to steal from."



**Vega de la Ventura** (vā′gä dā lä vān-tö′rä), an Argentine poet; born in Buenos Ayres, July 14, 1807. After political imprisonment he held places in the Spanish government; was secretary to the Queen Maria Christina, and in 1856 was appointed director of the Royal Conservatory. He wrote: "The Song of Songs" (Madrid, 1826); "An Epithalamic Cantata" (1827); "Agitation," an ode (1834); "The 18th of June" (1837); "The Defense of Seville," an ode (1838); "The Man of the World," a comedy (1840); and the tragedies "The Death of Cæsar" (1842); "Don Fernando de Antequera" (1845). He is considered one of the best modern Spanish poets. He died in Madrid, Spain, in 1865.

**Vegetable Chemistry,** the department of organic chemistry which investigates the chemical compounds found in vegetables. These compounds are chiefly made up of carbon, hydrogen, oxygen, and nitrogen, but potash, soda, lime, and other substances are occasionally present in small and variable quantities. Sugar, starch, gum, and other distinct compounds existing already formed in plants, and capable of separation without suffering decomposition are called proximate or immediate principles of vegetables. Proximate analysis is the separation of a particular principle from others with which it is mixed. Ultimate analysis consists in the reduction of the proximate principles to their simplest parts. The more important classes of compounds to be obtained from vegetables are acids, alkalis or alkaloids, oils, and resins. Coloring matter, tannin, albumen, gluten, yeast, and other substances are also obtained. Of the acids, the chief are acetic acid or vinegar, oxalic, tartaric, and benzoic acids. The alkaloids are organic bases which produce remarkable toxicological effects. During the germination of seeds there is a conversion of starchy matter into sugar. The nutrition of plants may be regarded as depending on solar energy, organic and mineral constituents, and water. See Botany.

**Vegetable Ivory,** the name which is applied to the kernels of the nuts (corozo nuts), produced by the *Phytelephas macrocarpa*, a palm growing in South America. It is very hard and compact, has the appearance of ivory, and may be turned in the lathe, being used for buttons, umbrella handles. etc. The stem of the palm is extremely short, but the leaves rise to the height of 30 or 40 feet.

**Vegetable Marrow,** a species of gourd cultivated as a culinary vegetable, and used fried, boiled, or otherwise.

**Vegetable Physiology.** The seasonal sequence of leaf, flower, fruit, and seed ever reminds us that plants live and change;

and the cycle of farm or garden operations is correlated with this. The relation of these processes to plant development must be closely and carefully examined, and the manifestations of life seen as the resultant of many hidden internal actions. It is useful to begin by sowing some seeds and studying the conditions under which they grow best, and what changes constitute this growth, and on these germination experiences base a fuller investigation of the life-processes of the adult plant.

*Germination.*— The seed sown must be alive. The common test — that a living thing breathes — may be adopted. In many cases this respiration can be shown by drawing the air surrounding the seeds through a tube containing lime water, when the insoluble white carbonate of lime is formed by the union of carbon dioxide, $CO_2$, with lime. In some cases transpiration (see below) can be detected. Most seeds in temperate regions live a year at least, sometimes two or more. When there is no winter, some seeds (as those of the coffee) must be planted almost at once. On the other hand, melon seeds have germinated when over 40 years old. The young plant must be nourished by food stored around or within it, till such time as it can make its own food. These reserves (see ALBUMEN: SEED) are not directly assimilable by the embryo, but must first be digested by "ferments" (see below), which exist in necessary quantity only at a certain period of the seed's life. The reserves are often very dry, and must have a supply of moisture before digestion and assimilation are possible.

No motion of particles bringing this about can take place if the seed be frozen; so a minimum of heat — from 4° to 13° C. — is necessary, and germination is impossible at temperatures higher than 36° to 46° C., and is most active at 26° to 35°, varying according to the nature of the seed. Other external influences are of comparatively little importance. The visible results of germination are the appearance of root, seed leaves, and shoot. The life processes of the seed have all been intensified — breathing is more rapid. transpiration is marked, and sometimes enough heat is given out to let us feel and measure it — *e. g.*, in malting. The seedling is very sensitive to all outside influences: it quickly droops in drought, shrivels up should the sun's heat be too great, and blackens if the nights be frosty. As the plant develops it becomes less influenced by environment, and soon begins to make its own food; but before discussing this special function of plants it is well to look at the life processes common to all organisms.

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*Respiration.*— Respiration is manifested by the intaking of oxygen O, and the final liberation of carbon dioxide, $CO_2$, gas. Attempts to grow most plants without free O are failures; and the $CO_2$ can be precipitated as calcium or barium carbonate when drawn through lime or baryta water. The activity of respiration is best measured by the number of volumes of gas per unit mass taken in and given out in unit time under constant conditions. Thus comparative accounts of the rate of breathing of different plants and of different parts of plants may be obtained, as well as the relative intensity of respiration at different ages of organism and of organ. Succulent plants and very dry ones do not respire so energetically as rapidly growing grasses and annuals; and the young plant breathes very actively, whereas the hibernating bulb or seed respires most sluggishly. External influences have no great effect on respiration, which, however, is somewhat quickened by a rise of temperature up to that which kills the plant. For most plants in normal conditions the volume of oxygen taken in is approximately the same as that of $CO_2$ given out.

Most cells are not immediately asphyxiated if deprived of free oxygen, but take it from some of the simpler organic compounds they contain or that surround them — a leading product in many cases being ALCOHOL (*q. v.*). The yeast plant has been domesticated for this purpose, and other molds and also many bacteria are able to prolong the process and convert large quantities of sugar into alcohol, or split up other substances into different constituents. Here the volume of $CO_2$ exhaled is greatly in excess of the O inhaled. The volume of O consumed is much greater than that of $CO_2$ liberated in other cases, such as that of the acetous ferment.

*Transpiration.*— The heat given off in respiration is partly used in evaporating water, ever present in organic substances. This vaporizing of water is usually termed transpiration. It may be shown by placing a plant in a pot on one of the scales of a balance, and noticing that the weight lessens, though, as we shall see, a green plant in the light must be adding to its substance all this time. Accurate estimations of the volume of transpired water can be made by sealing the moist soil and the root of a plant in a glazed pot covered with a waterproof lid, placing this under a bell-jar, supplying the plant with water-free air, and measuring the change of weight of the drying tubes through which this air is sucked after passing through the bell jar.

The amount of water vaporized is by no means constant. It varies with nature and age of plant, and part of plant, and

Vegetable Physiology

with external conditions. Some seeds, especially oily ones, cannot be found to transpire, others can; young plants readily do so, and leaves more vigorously than roots or stems. Transpiration seems very analogous to evaporation, and is less marked in moist conditions, but it never ceases in saturated air as the latter does. It is said to be less than evaporation because a plant killed and uninjured (by anæsthetics for instance) gives off more water vapor after death than before it; but the experiments are inconclusive. In fungi and other greenless plants the influence of light is noticeable to a slight extent, increasing transpiration. But if a green plant be kept in the light there is a much stronger marked maximum when the sun is brightest. When this plant is kept under a sealed bell glass for some time no $CO_2$ but an excess of O is found. If this last change be prevented by ether, respiration being unaffected, then the amount of water vaporized is increased. All these phenomena are closely related, and will be discussed below. The leaf is the green organ par excellence, and by its construction, its distribution on the plant, and its position with the surface normal to the sun's rays (except when these are excessive) it can arrest the greatest possible number of radiations.

The maturing leaf has two transpiration maxima. The first and greatest is when the leaf is very young and every surface cell can transpire freely. Gradually a cuticle develops which may be coated with wax in addition, and then the transpired water passes by the stomata. The crescentic bounding cells of these openings are specialized, and contain CHLOROPHYLL (*q. v.*), which, absorbing radiations, sets up activities synchronously with those of other green tissue of the leaf, and modifies the contents of these guard cells, so that they swell and open the stomata to their widest when the other green cells are most active. The second transpiration maximum occurs when most stomata are developed.

*"Assimilation" and "Chlorovaporization."*— When a plant grown in the dark is brought into the light it first turns green, and then begins its new functions. The yellow etiolin stops certain ether waves which transform it into green CHLOROPHYLL (*q. v.*) The spectrum of chlorophyll shows absorption bands in the red and violet, with less marked ones in the yellow. These waves move the molecules of plastic matter (protoplasm, solids, and solutions) associated with this chlorophyll, so that $CO_2$ is taken up and O is ultimately set free. This "assimilation" is the reverse of respiration, a deoxidizing process, an unburning where the sun's rays supply the needed energy. It often marks the breathing, and early physiologists were led to conclude that green plants respire in the reverse sense to animals. The volume of O given off is approximately the same as that of $CO_2$ taken in. Naturally optimum conditions of light promote optimum "assimilation," and the minimum occurs at night; but too bright light is injurious. Heat, up to 30° C. at least, increases it, and any optimum must be above this. A young leaf "assimilates" more vigorously than an old one. The increase of transpiration when a green plant is in the light is probably due to all the energy arrested by the chlorophyll not being spent in "assimilation," but in part vaporizing water; and this seems probable not only because more water is transpired when assimilation is inhibited by anæsthetics, while respiration is unaffected, but it is found that the blue and violet rays absorbed are more efficient in transpiration, while the red ones are most active in assimilation. M. van Tieghem has termed the transpiration, which is a function of chlorophyll activity, chlorovaporization, and others transpiration chlorophylliène. Chlorovaporization is a useful term when it is necessary to distinguish between it and the transpiration due to protoplasmic activity.

*Absorption.*— Plants living in water have all their epidermal cells absorptive, and need no elaborate water conducting system. Land plants must either extract the water from the air, or from the soil, or from both. Experiment shows that the roots are the active absorbers, and the fine root hairs near the tip of the roots, the special organs concerned in this. These absorbing hairs, as they are best termed, are drawn-out epidermal cells with walls of CELLULOSE (*q. v.*), differing from that of most cells in being more readily permeated by water, inside which is a lining layer of PROTOPLASM (*q. v.*). This double layered cylindrical bag is filled with cell sap.

The contact between these hairs and the grains of soil is very close, and a film of water coating their outside is continuous with that adhering to the particles of soil. The sap is more viscid than this mineral water outside, and so we have a living cell acting as a complex dialyzer (see OSMOSE) — colloid cell sap, crystalloid soil water, with protoplasm membrane supported by permeable cellulose skeleton work between. We have thus the conditions necessary for a flow of mineral water into the plant (any outflow being very small, though when acid aiding in the decomposition of the soil), which is continuous as long as these conditions remain constant. The cell sap made less colloid by this influx of water is crystalloid compared to that of the inner cell, and the current accordingly flows inwards. Yet this is but the crudest approximation to a full explanation, for not only are the

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variations of the cell sap's quality due to this dilution to be considered, but also those due to protoplasmic activity, and in addition to the fact that the osmotic properties of the protoplasmic membrane itself are ever being modified by its continual oxidation and deoxidation.

*Movements of Water.*— In water plants and those living in damp conditions, as well as in low-growing plants, osmose is the main agent. We need not imagine a long series of cells, each with its sap more colloidal than that of the next in order; for even in the laboratory the reversing of a membrane sometimes alters the direction of the current, and the plant membrane is very complex in structure, as well as constantly changing. It is difficult to set a limit to the influence of osmotic action.

Experiments making plants absorb tinted water show that it passes up the wood (xylem) part of bundles, as may also be proved by noticing that only when the young wood has been incised all round do the leaves wither, and even hollowing out old wood does not induce drooping. Conifers have true vessels only in first-formed wood; hence any satisfactory explanation must not lay too much stress on capillarity, which would account for a rise of a few feet at most. Much stress has been laid on the porosity of the cell walls and their permeability by water, and Sachs in his "imbibition theory" has emphasized the mobility of this water, and believes he can explain the phenomena by its aid. The transpiration of water helps to raise water owing to pressure differences resulting from it, and these may be increased by the bubbles of air in the vessels or fibers losing their oxygen to respiring cells, the $CO_2$ given off being dissolved in the water. But pressure differences can account for no more than a few yards of rise.

The pressure from below at some periods of the year is very considerable, as Stephen Hales showed in his classical experiments on "root pressure," when the watery sap was forced up a tube tightly fastened to the end of a cut stem. This is most noticeable in spring, and in part at least is a function of temperature, for a slight heating of the soil will sometimes make an experiment work more rapidly. This "root pressure" gives rise to "bleeding" when the sap is forced out at buds in spring, and to "dew" when exuded along the edge of a Lady's Mantle or other leaf. This exudation occurs from stomata in grasses, etc., and from special organs in saxifrages, balsams, etc. (called water pores or stomata). Should the water have passed through a sugar-laden tissue it becomes nectar, and the organ a nectary. Some plants show an excessive development of water pores and nectaries, and may be specially modified so that the exuded sap may be retained — *e. g.*, the pitcher plant.

*Metabolism.*— We have seen how green leaves are supplied with gases, water, and dissolved salts, and how they can trap special ether waves. The active energy of these waves is used to transmute the simple inorganic compounds into complex organic ones, which in the process of respiration are reduced to simpler substances again, and the potential energy transformed into kinetic. These metabolic changes take place in living cells full of intense activities. Currents course through the protoplasm and cell sap in every direction and between the cells, which are also united by strands of protoplasm. The gases used and given off in respiration and "assimilation" are floated in and out, and each protoplasm particle burned or unburned is the center of an area of disturbance. Pure protoplasm is influenced equally by all rays; that associated with chlorophyll is affected by certain red and violet rays in particular. These, especially the red ones, bring about the dissociation of the elements of the $CO_2$, the assimilation of the C, and the excretion of the O. But carbon is not found isolated in the plant. The simplest carbon compound found in a green leaf after a few minutes' exposure to light is starch. Remembering that the same volumes of $CO_2$ are absorbed as of O excreted, we may write a chemical equation expressing results though not processes: $6CO_2 + 5H_2O = C_6H_{10}O_5 + 6O_2$. But we suspect that starch has had a more complex life history, and that the first-formed organic compound is probably simpler, though very difficult to detect. Probably formic aldehyde is the product, and again the first and last chemical conditions may be written $CO_2 + H_2O = CH_2O + O_2$. From this higher compounds of C, H, and O may be formed.

Since the synthetic process is hidden from us, it will be best to give an idea of the gradual increase of complexity of the compounds found in plants. With nitrogen added to carbohydrates, amides are formed, and when S and P are combined with these, the proteids. Protoplasm may be either a peculiar unstable arrangement of proteid molecules or a collection of many compounds in a similar unstable condition, so that the wandering oxygen molecules coming in contact with them explosively seize hold on some of the C, and completely unite with it in the most stable way. The protoplasm is constantly oxidizing to be deoxidized again, burning to unburn. Irritable and unstable, it is formed to be destroyed, and recomposes only to be once more decomposed.

The result of this burning of protoplasm is either to form proteids, which may become protoplasm again or decompose into simpler compounds; or else to form a com-

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bination of compounds — proteids, carbohydrates, etc., which wholly or in part may form new protoplasm, be reduced, or remain in their new form. It is very difficult to discover whether a compound is a synthetic or a decomposition product; and it is just as hard to obtain some substances at all, since they are transferred to another cell, or transformed to another shape almost as soon as they are formed. Other substances, however, may be stable for a long time. Any matter used to form protoplasm is called a food reserve, and what is not utilized in this way is a waste. Both may be temporary or last for a considerable time. The same substance may be both a temporary and a seasonal reserve; for instance, starch found in green leaves during the day disappears at night; and starch is the main reserve in many seeds, tubers, etc.

The matter elaborated in the leaves is conveyed to growing and storing organs. Many constituents of elaborated matter cannot be transferred as they are, but must be changed to soluble substances, capable of passing through the cell membranes. This is effected by digestives, often called "soluble ferments," which are found in all living cells. Insoluble starch is acted on by diastase, and changed to a cane sugar, which in turn is "inverted" to soluble glucose; insoluble proteids are changed to soluble peptones by pepsine, etc. This soluble matter is transported by bast cells, as is shown by peeling the bark off a tree, when growth takes place above the ringed part alone. A chain of living cells may osmotically conduct this elaborated sap, while the sieve vessels of the bast are active according to some, or according to others may be storehouses supplying food to the actively growing and dividing embryonic tissues (cambium) rather than conductors. Some wastes are at once excreted — *e. g.*, O, $CO_2$, $H_2O$; some are secreted, and others are deposited in aggregates or crystals. Some so-called wastes are used again, and really are seasonal reserves. Many wastes are of great use in industry and medicine. The odors and colors of plants are probably wastes (chlorophyll itself is sometimes thus classified).

*Composition of Plants.*— The plant uses O in respiring and $CO_2$ in assimilating, both of which come from the air. Water and the salts dissolved in it supply the other elements which are absorbed by the roots. All substances washed out of the soil are not used by the plant, but cease to enter when its lower cells become saturated; whereas the constant assimilation of any useful salt makes it be constantly absorbed. Some plants use more of one substance than of another, and a soil soon becomes poor if the same crops be constantly grown on it. Thus we need to have rotation of crops and also fertilizers. Plants may be grown in clean sand, and watered with nourishing solutions. But soil is not essential (witness hyacinth culture in our rooms), provided the roots are properly protected, supported, and supplied with water and the necessary minerals. An excellent solution for watering or growing plants is the following "normal culture solution:" Dissolve 1 gramme nitrate of potash, ½ gramme sulphate of magnesia, ½ gramme sulphate of lime, and ½ gramme common salt in 1 liter of distilled water, and add a trace of phosphate of lime and of any ferrous salt.

*Growth.*— After germination the root of the young seeding spirally winds its way down among the particles of the soil, turning away from them with its sensitive tip, seeking out the moister parts. Behind the tip it clasps anything it touches and thus anchors itself. As it grows older it contracts, making this anchorage securer. The shoot, often with arched head, shoulders its way upward toward the light, twisting round more or less as it rises. Root and shoot grow in thickness as well as in length. The rate of growth varies greatly. Bamboos are said to lengthen 10 inches in 24 hours. Our cereal crops (36–60 inches high) ripen about 20 weeks after the sowing of the seed, and some trees are hundreds of years old. Growth is most active in spring, and elongation is greater at night than by day, and indeed varies from hour to hour — the Victoria regia leaf, according to Drude's experiments, lengthening 99.4 mm. between 11 P. M. and midnight, and 127.9 mm. between 12 and 1 A. M. The greatest elongation takes place near the tip both of root and of shoot, within the last few millimeters in the former, on the last few centimeters in the latter.

In rapid-growing parts respiration is naturally very active and transpiration stimulated; but it must be noted that the maxima of elongation and of transpiration do not coincide. Growth may occur below freezing point, but in some plants none takes place below 10° C. or 15° C.; the best temperature varies from 20° to 36° C., and the maximum from 36° to about 50°, but plants are found growing in warm springs hotter than this. Light retards growth. A certain amount of water is essential to its occurrence. The matter used for the permanent changes we call growth comes from the excess of it elaborated over that used to repair waste, and the energy from the heat given off in respiration. It is necessary to examine what changes constitute this growth more closely; but, unfortunately, a satisfactory mechanical explanation seems scarcely possible.

It is necessary to imagine all the stir and change going on in the CELL (*q. v.*). The protoplasm grows by new organic matter

formed by the chlorophyll grains being digested and assimilated. At the limit of growth cell division occurs (see CELL). After a cell has ceased dividing, the mass of its protoplasm is probably not greatly increased, but vacuoles appear in it, and as the cell grows older and elongates the protoplasm finally forms a membrane bounding one large sap vacuole and lining the cell wall. The protoplasm has been rapidly adding to the cell wall, and at last the wall assumes its final shape and markings. The elongation is due to the distension (*turgor*) of the cell by accumulated water. When a plant is rapidly transpiring (for instance a green plant in sunlight) the cells are not so likely to become turgescent. This is one cause at least of the lengthening being greatest by night, and it is well to emphasize that it is elongation that is then a maximum, and not necessarily the substantial increase which makes it permanent. When the wall is stretched in this way new cellulose can most readily be added. The cellulose may be deposited as such, or precipitated from some compound the rest of whose constituents are soluble. The unit may be the cellulose molecule, or a more complex one formed of an intimate union of several molecules (micellæ of Nägeli).

There are several theories as to the way in which the cellulose in any of the conditions just mentioned may be deposited. It may be plastered on inside of the wall (apposition theory), or the protoplasm may penetrate the cellulose wall and there lay down new matter, or the cellulose may be floated into position between old particles (intussusception). The transformation of cellulose into wood (lignin), or cork (suber), or gum (mucilage) may be explained most readily by one of the two latter hypotheses. The constant passage of cell sap, and the permeability of the cell wall (unless corky or gummy) must never be forgotten.

*Movements in Plants.*—The constant currents in cell sap and protoplasm may be coördinated so that the whole contents are caused to glide round and round the cell (elodea), or stream from side to center, and from the nucleus back to the wall again (stamen hairs, tradescantia). Sometimes this affects the whole organism, which may creep along like an amœba (myxomycets) or slowly swing to and fro (oscillatoria); or may be concentrated in one special part of the organism (cilium) whose rapid movements transport the plant from place to place (volvox, zoöspores). The sleep of plants may be explained as a partial periodic movement of plants, and classed among these natural movements. A number of motions are to be seen when a plant is specially stimulated.





*Habits of Plants.*—The simplest plants live in water, but other forms exist underground (see TRUFFLE), while some can live in sugar (YEAST, *q. v.*), or in oil. The majority, however, are fixed to the soil and spread their expansions in the air. Some simply scramble along the ground (see BRAMBLE), some keep erect, and others twine and climb up their stronger neighbors or other support to reach the light. Plants may live on decaying matter (see SAPROPHYTIC PLANTS), or other living plants (PARASITES, *q. v.*); many associate with other plants or animals, each mutually helping the other.

*Reproduction.*—At the limit of growth cell division occurs; and sometimes special cells are cut off which either separately or after union with another cell are capable of reproducing the plant.

**Vegetarianism,** a system popularly declusively, and abstaining from all foods obtained from the vegetable kingdom exclusively, and abstaining from all foods obtained from the animal kingdom. This is an approximately correct definition of what was meant by the word when the Vegetarian Society was founded in Manchester, England, in 1847. It was not long, however, before it was discovered that there was as great a need of discrimination in the use of the various products of the vegetable kingdom as there was cause to abjurc the use of flesh. Vegetables are not all equally wholesome, some are absolutely poisonous. There is a great difference between the stalks and leaves and the seeds of plants. Cooked and uncooked foods differ greatly. The study of food leads to the study of equally important laws. Eggs, milk, cheese, butter (animal products) differ from the carcasses of slaughtered animals. Many of the arguments against the use of flesh do not apply to the use of fish. These and similar questions arose, and so sects sprang up. Some ate fish; some were called Vems (eating vegetables, eggs, and milk); some were strict vegetarians or Vegs (excluding all animal products); some took up the edenic diet (excluding all cooked foot); some, though using cooked food), excluded cereals; some adopted a theory of a specific vitality in uncooked fruits, grains, nuts, and pulses, specifically adapted to the development of man on his four planes of body, mind, soul, and spirit. Out of this clash of conflicting ideas there gradually grew up in the London Society a symmetrical theory which has widened the basis of vegetarianism (neo-vegetarianism), It holds that nature is governed by universal law; that health, happiness, and life are normal, and disease, misery, death abnormal; that man has power to regain the normal by obedience to the laws of nature (the abnormal being the re-

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sult of inherited or personal disobedience); and that vegetarianism is coincident with obedience to these laws.

In strictness, therefore, no one is yet entitled to the name of vegetarian, but since it is believed that the eating of flesh is antagonistic to progress on so many grounds, and that reform in food is the basis of all individual reform, the renunciation of flesh in whole or in part is made the test question of vegetarianism, leaving the positive question of what articles in the vegetable kingdom constitute man's proper food to be one of the branches of further study. In support of abstinence from flesh the following 10 claims are made: I. Physiology proves man to be closely akin to the frugivorous ape and essentially different from the carnivora, herbivora, or omnivora. But it is objected that man has canine teeth, and his intestines of mid length between the herbivora and carnivora show that he should partake of the food of both. To this the reply is that canine teeth are found in apes also; and the mean length of his intestines proves rather that he is fit for neither than for both forms of food, for grasses need long intestines which he has not got, and flesh needs to be passed away very rapidly through intestines shorter than man's, to prevent putrefaction. Physiologically and anatomically man can scarcely be differentiated from the higher apes. II. Embryology shows that to be a permanent differentiation of type which comparative anatomy shows to be actually different; the typical herbivora being placentally nondeciduate, the carnivora zonary deciduate, and apes and men discoidally deciduate. III. Chemistry proves that all elements for perfect nutrition in assimilable forms are found in a proper vegetarian dietary. It is objected that (*a*) an enormous bulk must be consumed to get the requisite nutriment; (*b*) flesh is food ready prepared by another animal, and so requires less vital strain to assimilate it than vegetable food. It is replied that (*a*) increased bulk is not necessary — *e. g.*, of flesh alone it would be necessary to eat 96 ounces per day to get sufficient carbon; of bread alone, 64 ounces to get enough proteids; of mixed flesh and bread, 42.3 ounces (34.5 ounces bread and 7.8 ounces beef) would suffice; similarly 34.6 ounces of a mixture of 9.5 ounces lentils and 25.1 ounces of bread, or 24.1 ounces of almonoids and raisins, would give the same result; (*b*) animal cells are not absorbed as cells, but must be broken down and converted to chyle before absorption, so that assimilableness varies as much between different sorts of flesh as between flesh and non-flesh foods. Thus pork takes, raw, 3 hours; well roasted, 5¼ hours; beans, 3½ hours; beef, raw, 2 hours; well boiled, 2¾ to 3 hours; well roasted, 3¼ to 4 hours; rice, boiled, 1 hour; fresh-baked bread, 3½ hours to digest. IV. Flesh as sold is diseased to a very high percentage by diseases communicable to man, which the purchaser is quite unable to detect. V. Higher instincts revolt against taking life, and the repression of these higher instincts prevents evolution of the higher man; while the relegation of the function of slaughtering to others is the unjust perpetuation of a degraded class to be an ever-constant source of danger to the stability of the morality of the community for the sake of supplying the luxurious demands of an artificial appetite. The objection made is that butchers are often kind and gentle, and that other occupations produce types of men as low as slaughter men. VI. Unnecessary destruction of life is immoral. Objections are made — (*a*) that it begs the question to say that flesh food is unnecessary; (*b*) the land would be overrun if the animals were allowed to breed unhindered; (*c*) is it not more merciful to breed, tend, feed, and painlessly kill, than allow the animals to battle for existence and then die of hunger or fall a prey to the carnivora? The reply to these difficulties is — (*a*) physiology and chemistry prove flesh to be unnecessary; (*b*) the balance of nature prevents overrunning — *e. g.*, is any new land when discovered overrun with animals, though they have had countless ages in which to propagate unhindered by man's interference? (*c*) the problem presented is hypothetical, for in reality the cruelties inflicted by man on the animal world are appalling, and for these cruelties the habit of flesh eating is to a great extent responsible. VII. It is economically superior — for 1.281 pounds of oatmeal at a cost of 6 cents will supply power to raise 140 pounds to the height of 10,000 feet, while of beef fat it would take .555 pounds at a cost of 9 cents, or of beef lean 3.532 pounds at a cost of 85 cents. On the other hand it is said that if all were to adopt it it would simply mean an all round depreciation of wages by a reduction of the subsistence minimum. VIII. Physical strength increases, as proved by the usually superior physique of peasants to that of middle classes; Arab porters, Indian runners, and Scotch and Irish peasants are especially pointed out as physically above the average, while the frugivorous gorilla is noted for enormous strength. But it is objected that (*a*) men who are so fed improve when flesh is added to their diet: (*b*) many Hindus are puny and staminally weak. It is replied that (*a*) they appear to improve because flesh is a stimulant, and so transforms latent energy into manifest force; (*b*) it is not claimed that a diet chiefly composed of rice is the best, while the fact

that many fine races do live without flesh proves that under such conditions at any rate it is not a necessity; and immediately the non-necessity is admitted the whole weight of the moral argument enters the scale against the habit. IX. Whereas 12 acres of land, if used for the rearing of cattle for slaughter, will maintain one man feeding on the flesh produced, the same area under wheat will maintain 23, and on a mixed crop of fruit, pulse, grain, and vegetables a still higher number. The objection here is that much land is suitable for nothing else but, *e. g.*, sheep runs. By the vegetarian this may be granted, but the assertion does not apply to the thousands of acres of valuable horticultural land now under grass. X. It is claimed that horticulture, and especially petite culture, would employ an enormously greater amount of labor than does stock raising, and so tend to afford a counter current to the present townward drift and to congested labor centers.

Vegetarianism has spread so extensively that in addition to its pledged adherents it has a still greater number who practise abstinence from flesh to a greater or lesser degree in obedience to medical advice, for the curing or relieving of disorders of digestion, gout, and rheumatism. The Catholic Church enjoins abstinence from flesh during Lent, and on some other days during the year. Many religious orders (*e. g.*, the Trappists) abstain wholly from flesh. Brahmins also abstain from flesh and eggs. The Vegetarian Federal Union was formed in 1889. Its offices are in London. To it are affiliated the Vegetarian Society, the London Vegetarian Society, a considerable number of other English societies, and those of the United States (founded in 1850), Germany, and Australia. An international congress was held in Cologne in 1889, and in London in 1890. There are now vegetarian restaurants in many large towns.

**Vegetius, Flavius Renatus** (ve-jē′tē-us re-nā′tus); a Latin writer on the art of war, 4th and 5th centuries; born presumably in Rome. He compiled in four books an "Epitome of the Military Art," excellent editions of which were published in Strassburg (1806) and Leipsic (1885). There is an ancient treatise, "On the Veterinary Art," credited to him.

**Vehmgerichte.** See FEMGERICHTE.

**Vehse, Karl Eduard** (vā′ze), a German historian; born in Freiburg, Saxony, Dec. 18, 1802. He was archivist in Dresden in 1825; later settled in Berlin; but was imprisoned and banished for his "History of the German Courts since the Reformation" (48 vols. 1851–1858). Besides this monumental work, he wrote: "History of the Emperor Otho the Great" (1828); "Tables of Universal History" (1834); "Course of Universal History" (1842); and "Shakespeare as Protestant, Politician, Psychologist, and Poet" (2 vols. 1851). He died in Striesen, June 18, 1870.

**Veii** (vē′yī), an ancient city of ETRURIA (*q. v.*); in early times the formidable rival of Rome, supposed to have been at Isola Farnese, 12 miles from Rome. It waged 14 distinct wars with Rome — an almost incessant warfare down to its capture after a 10 years' siege by Camillus (396 B. C.).

**Veil,** or **Vail,** that which conceals; a cover to conceal the face; any kind of cloth which is used for intercepting the view, and hiding something; especially a piece of thin cloth or silk stuff, used by women to hide their faces. A veil is an indispensable part of the out-door dress of Eastern ladies, who live secluded from the sight of all men except their own husbands and their nearest relatives. If an Egyptian lady is surprised uncovered, she quickly draws her veil over her face, with some exclamation like, "O, my misfortune!" The custom of wearing veils is so ancient as to be lost in remoteness; its use, however, has not been prevalent at all times. Sarah, the wife of Abraham, and Rebekah and her companions at the well, do not appear to have worn them. Gen. xii; 14, 15; xxiv: 16.

**Vein,** in anatomy, one of a number of thin ramifying elastic tubes arising in the extremities of the body, and proceeding by a more or less direct course to the heart, to which they carry back the blood sent forth by the arteries and transferred to them by the capillaries connecting the two kinds of vessels. They fall under three great divisions: the pulmonary, the systemic veins, and those constituting the portal system. The pulmonary veins consist of four short venous trunks which carry the red blood back from the lungs to the left side of the heart, and which are found two on each side in the root of the corresponding lung. The systemic veins arise by small branches, which receive the blood from the capillaries throughout the body, and uniting to form larger vessels and then two large venous trunks, the superior and inferior venæ cavæ, finally enter the right auricle of the heart, into which the coronary veins also conduct the blood which nourishes that organ itself. These systemic veins are naturally divided into two groups, according to the channel by which they enter the heart. The veins of the head, the neck, the upper limbs, the spine, the heart, and part of the walls of the thorax and abdomen, make their entrance into the right auricle by the superior vena cava, while those of the lower part of the trunk and the abdominal viscera do so by the inferior

vena cava. The veins of the portal system bring back the blood from the stomach, the intestines, the spleen, and the pancreas; then joining, they form the great portal vein which ramifies in the surface of the liver, after the manner of an artery, before finally entering the heart by the inferior vena cava.

The anastomoses of veins are much larger and more numerous than those of arteries. In many parts of the body there are two sets, one superior, the other more deeply seated, with frequent communications between the two. Some veins possess valves, while others are destitute of them. All the ramifications of veins are named; the most important will be found in the dictionary. The walls of the veins are thinner than those of the arteries, but the veins themselves are less elastic. The total capacity of the veins is much greater than that of the arteries; so much so that the veins alone can hold the mass of blood which in life is distributed over both arteries and veins. While there is a considerable pressure even in the smaller and a greater one in the larger arteries, the pressure in veins is greatest in those of smaller bore, and even in them is but slight; hence, while a pulse is present in the arteries, it is as a rule absent in the veins. The velocity of the blood in the veins is least in those of smaller diameter and greatest in the larger trunks, which is the reverse of the rule in arteries. When a vein is cut the flow from the distal end — *i. e.*, from the end nearest the capillaries — is continuous, but the blood is ejected with little force. The chief affections to which veins are subjected are: Inflammation, varix, hypertrophy, atrophy, degeneration, phlebolites, parasites, and new growths. In surgical operations the accidental sudden entry of air often causes death by arresting the pulmonary circulation. If slowly injected an enormous quantity may be (and has been) pumped into the vein with impunity, while a quantity sufficient to fill the auricle, entering suddenly, would certainly prove fatal. The first recorded case of spontaneous entry of air in man occurred in 1707, though experiments had been made on the lower animals in the 17th century.

In botany, one of the ramifications of the petiole among the cellular tissue of a leaf, of which they constitute the framework. They are of fibro-vascular tissue, and carry sap into the parenchyma. The principal vein, that which forms the continuation of the petiole and the axis of the leaf, is called the costa or midrib, a term which Lindley proposes to extend to all main veins proceeding direct from the base to the apex of a leaf, or to the points of its lobes. The ramifications sent out by the midrib, called by some lateral ribs, he terms primary veins. They curve toward the apex, and anastomose with the back of the primary vein which lies next to them. The part of the pulmonary vein which curves in the vicinity of this anastomosis he calls the curved vein, and those external to it the marginal veins. Veins running at right angles from the midrib and alternate with the primary veins he terms costal veins.

In geology, a crack in a rock filled up by substances different from the rock. These may be either earthy or metallic. In very many cases the fissures have been produced by volcanic or earthquake action, and they often coincide with faults. Water descending by these fissures to unknown depths has been raised to so high a temperature that it has become capable of holding in solution various metallic and other mineral substances. As the water has cooled it has gradually deposited these matters held in solution, not doing so simultaneously, but in succession. Metalliferous veins vary greatly in width, being sometimes a few inches, frequently three or four feet, and sometimes much more. The thinner portions often branch off into innumerable slender ramifications like the veins of an animal, whence their name. Sometimes part of the material filling veins has fallen in from above or been segregated from the rocks constituting the sides of the fissure. They are often parallel, are associated with dykes, and are more common in the palæozoic than in more modern strata. They vary in age, and not infrequently one crosses another. In mining, a lead or lode of ore-bearing rock, alive or dead; that is, containing ore or not; also a seam of metalliferous matter filling up a former fissure in rock.

**Veinlet,** in ordinary language, a little vein; a vein branching off from a large vein. In botany, a vein of the smallest size. Lindley describes and names three kinds of them in the leaves of plants: (1) Marginal veinlets, constituting a fine network of minute veins connecting the external veins with the margin of the leaf. The primary veins are themselves connected by fine veins, which he calls (2) Proper veinlets, where they immediately leave the primary veins, and (3) Common veinlets, where they anastomose in the area between them.

**Veit, Philipp** (fīt), a German painter; born in Berlin, Prussia, Feb. 13, 1793. His mother, a daughter of Moses Mendelssohn, had for her second husband Friedrich Schlegel and Veit became devotedly attached to the religious and artistic ideas of his stepfather, like whom he embraced Catholicism. After finishing his studies at Dresden, he proceeded to Rome in 1815, and became a prominent member of that band of young German painters who sought to

infuse into modern art the purity and earnestness of mediæval times. Of all the associates Veit ventured furthest intc the obscure realms of symbolism and allegory. His first famous work was the "Seven Years of Plenty," executed as a companion piece to Overbeck's "Seven Years of Dearth," and forming part of a series of frescoes illustrative of the history of Joseph, painted at the Villa Bartholdy in Rome. Other pictures of his Roman period are: "The Triumph of Religion" (Vatican), "Scenes from Dante's Paradiso" (Massimi Villa), and an altarpiece, representing "Mary Queen of Heaven," in the Trinità de' Monti. These procured him so great a reputation that he was called in 1830 to the directorship of the Art Institue in Frankfort-on-the-Main. While holding this position he produced many grand pictures, of which the most celebrated is the large fresco (at the Institute) representing "Christianity bringing the Fine Arts to Germany." In 1843 he removed to Sachsenhausen in Hesse-Cassel, in 1853 to Mainz. He died in Mainz, Dec. 18, 1877.

**Veitch, John,** a Scotch educator; born in Peebles, Scotland, Oct. 24, 1829; studied at the University of Edinburgh and from 1855 to 1860 was assistant to successively Sir William Hamilton and Professor Fraser. He himself became Professor of Logic and Rhetoric at St. Andrews in 1860, and at Glasgow in 1864. His works include a "Memoir of Sir W. Hamilton" (1869); "Tweed and Other Poems" (1875); "History and Poetry of the Scottish Border" (1877, new ed. 1892); "Feeling for Nature in Scottish Poetry" (1887); "Knowing and Being" (1889); "Merlin and other Poems" (1889); "Dualism and Monism," and "Border Essays" (1896). He died Sept. 2, 1894.

**Veitch, William,** a Scotch scholar; born in Liddesdale in 1794; qualified at Edinburgh for the Church of Scotland; but finding his true walk in scholarship, he published a text of Cicero's "De Natura," and "Greek Verbs Irregular and Defective" (1848, 4th ed. 1878), which led to his employment by Liddell and Scott in revising successive editions of their lexicon. He rendered similar services to Smith's "Latin-English Dictionary," and to a vast number of school books and works of reference, classical and theological, generally at the solicitation of their editors, whom he had trenchantly reviewed. A humorist and entertaining raconteur to the last, he died in Edinburgh, July 8, 1885.

**Vela, Vincenzo,** a Swiss sculptor; born in Ligurnetto, Switzerland, in 1822; learned the trade of stone cutting; but in 1836 turned his attention to drawing. In 1847 he settled in Rome, and in 1848 was a volunteer in the Italian army during the war against Austria. He later removed to Turin and became celebrated by his statues. His works include: "Christ raising the Daughter of Jairus"; "A Prayer"; "Spartacus"; "Harmony in Tears" (1855); "France and Italy" (1863); "Columbus and America"; "The Last Days of Napoleon"; "Spring"; etc. He was made an officer of the Legion of Honor in 1867. He died in Bellinzona, Ticino, Oct. 3, 1891.

**Velalcazar, Sebastian de.** See BENALCAZAR.

**Velarium,** the great awning stretched over the roofless ancient Roman theaters or ampitheaters, as a protection against rain or the sun's rays. These awnings were generally of wool or linen; cotton was used for the purpose a little before the time of Julius Cæsar. This vast extent of canvas was supported by masts fixed in rings in the outer wall. In the Great Theater at Pompeii, these rings may still be seen; they are at regular intervals, and one above another, so that each mast was fixed in two rings. There is a similar contrivance in the Coliseum at Rome; but there the masts were on the outside of the walls, and rested on consoles, passing through holes cut in the cornice.

**Velasquez, Diego Rodriguez de Silva y,** a Spanish painter; born of a Portuguese family in Seville, June 5, 1599. From the

DIEGO VELASQUEZ.

studio of Francisco Herrera, an artist of note, he passed to that of Pacheco, whose daughter, Juana, he married in 1620. His

early art, humble in aim and somewhat vulgar in type, is seen at its best in the "Water-Carrier" at Madrid, a work of characteristic vigor and keenness. To this early experience has been ascribed a certain want of elevation in his later work, an absence of the higher eclectic spirit manifested by tolerance of the painful or ugly. In 1622 he went to Madrid, where in the year following his portrait of Olivarez procured him the patronage of Philip IV., a wonderful portrait of whom at once established the fame of the painter. As court painter he produced many portraits of the royal family and of illustrious visitors, the latter including one of Charles I. of England, which has been lost. Velasquez formed a cordial friendship with Rubens during the diplomatic visit of the Fleming to Madrid in 1628. In 1629–1631 he made a tour in Italy, visiting Rome, Naples, Florence, Venice, etc., and being received everywhere with the highest distinction. His style, already developed, bears little trace of Italian influence, but his admiration was sympathetically touched by the glory of Venetian art, and he expressly records his preference for Titian over Raphael and Michael Angelo. On his return to Madrid he made rapid progress in the royal favor; was made royal Ayuda de Camera or chamberlain (1643); his studio was removed to the palace, and there in friendly converse with the painter the king spent much of his leisure.

This relationship was undisturbed by Velasquez's grateful conduct to the disgraced favorite, Olivarez, and in 1648 he was sent by the king to Italy, commissioned to buy works of art. At Rome he painted the portrait of Innocent X., which is now the gem of the Doria gallery. He was subsequently appointed Aposentador Mayor, or royal seneschal, and in 1656 received the Cross of Santiago, an honor till then reserved for the highest nobility. But Velasquez did not thrive under his load of honors; his health gave way in the service of the court; and he died in Madrid, Aug. 7, 1660. Though there are specimens of Velasquez in the galleries of London, Paris, Vienna, Munich, etc., it is only at Madrid that the range and resource of his art can be duly estimated. His portraits are not mere, "sallow, mustachioed Spaniards in black cloaks," but veritable human counterfeits, strong, vivid types of individuality, instinct with the subtlest shades of expression. The "Adoration of the Magi," his earliest-known picture, bears date 1619, and among his better-known works are the "Boracchos," "Forge of Vulcan," "Joseph's Coat," "Surrender of Breda," a "Crucifixion," "Dwarfs," "Coronation of the Virgin," "The Meniñas" or "la Familia" (royal family), the "Hilanderas" or "Spinners," and, his last, "St. Anthony the Abbot visiting the first Hermit St. Paul in the Desert" (1659), of which Wilkie says it has "the very same sun we see, and the air we breathe, the very soul and spirit of nature."

His historical pictures are grandly representative, and combine imaginative power with technical dexterity. Only in the treatment of religious subjects does he fail of the highest success, and only fails in defect of that sacrosanct purity, that spiritual majesty, which was the rare gift of the older Italians. Courts could not make a courtier of Velasquez, whose main characteristics are dignified repose and uncompromising honesty. The brown tone, dark shadows, and hard outlines of his earlier style were gradually replaced by a chord of silvery-grey, by aërial clearness and transparency, and a finer gradation of tints. His versatility is seen in his triumphant treatment of animals, landscape, and domestic life. As a colorist Velasquez belongs to the first rank; his execution, strong, rapid, and rugged, has exerted a powerful influence on painters so unlike as Wilkie and Phillip, as well as on the modern Spanish school represented by Madrazo and Fortuny.

**Velázquez, Diego de,** a Spanish explorer; born in Cuellar, Spain, about 1460; accompanied Columbus to Española in 1493, and there distinguished himself in the wars against the Indians and amassed a fortune. In 1511 Diego Columbus appointed him to conduct an expedition against Cuba, and in the latter part of the year he landed on the E. shore at the head of 300 troops. He quickly conquered Hatuey the cacique, and put Panifilo de Narvaez, his lieutenant, in active command. The unarmed natives were soon overcome, and subjected to slavery, in which they soon perished. Later Velásquez established Matanzas, Trinidad, Santiago, and other places. In 1517 he joined Cordova in an expedition after slaves and they discovered Yucatan. Soon after, on learning of the rich Aztec empire, he fitted out an expedition for its conquest and placed CORTÉZ (*q. v.*) in command. When the latter had reached the site of Vera Cruz he took independent command. Pafilo de Narvaez was sent to capture him in 1520, but was defeated. Velásquez died in Havana in 1522 or 1523.

**Veldecke, Heinrich von.** See HEINRICH VON VELDECKE.

**Velez-Herrera, Ramon** (vā'leth-ā-rā'rä), a Cuban author; born in Havana, in 1808. He abandoned law for literature. The first collection of his poems was published at Havana in 1833, a second in 1837, and a third in 1838. He also published: "Elvira de Oquendo"; "The Two Bridegrooms," a comedy (1848); "Autumnal Flowers," a

collection of poems (1849); "Cuban Romances" (1856); "Napoleon in Berlin," a tragedy (1860); and "Flowers of Winter," poems (1882). He died in Havana in 1887.

**Veliki-Luki,** an old town of Russia; in the provine of Pskov; on the Lovat; 124 miles N. W. of Smolensk; with 9 churches and 2 monasteries, and manufactures of Russia and other kinds of leather.

**Veliki-Ustiag,** a town of Russia, in the province of Vologda; at the junction of the Jug and the Suchona; 240 miles N. E. of Vologda, and on the great road from Archangel to Siberia. One of the principal seats of industry in Northern Russia, it has active manufactures of cloth, linen, leather, soap, wax candles, enamelled gold and silver wares, and a large trade in furs.

**Velino** (vā-lē′nō), a small stream of Central Italy; a tributary of the Nera, at its junction with which it forms beautiful falls about 650 feet high. See TERNI.

**Velites,** the light-armed infantry attached to a Roman legion. They were equipped with bows, slings, and javelins, a light wooden buckler covered with leather and a head piece.

**Velia,** in entomology, a genus of *Hydrometridæ.* Antennæ filiform, four-jointed, the first joint the longest, the others about equal to each other in length, and bent at an angle with the first. Rostrum two-jointed; legs moderate, nearly equidistant.

**Vella,** in botany, the cress rocket; the typical genus of *Vellidæ.* Calyx erect; pouch swollen, two-celled, with a dilated flat-winged style, twice as long as the valves; seeds four in each cell. *V. annua,* the annual cress rocket, is said to have been found on Salisbury Plain, but not since the time of Ray.

**Velleius Paterculus** (vel-ē′yus pā-ter′-kū-lus), a Latin historian of the 1st century. He wrote a "History of Rome," a synopsis of Roman history from the fabled migration of Æneas to A. D. 30. The latter half of the work is not without value for the early empire.

**Velletri,** a town of Central Italy, in the province of Rome; picturesquely situated on a spur of the Alban Hills, near the Pontine Marshes; 26 miles S. E. of Rome. It is the seat of the Bishop of Ostia, and has a cathedral (San Clemente), a classical school, a technical school, and several fine palaces. On March 19, 1849, Velletri was the scene of a defeat of the Neapolitan troops by the Roman Republicans under Garibaldi.

**Vellore,** the most populous town of the district of North Arcot, Madras presidency, British India; near the left bank of the Palar river; 80 miles W. of Madras. The old fort, which was formerly very strongly garrisoned, now contains only a single regiment of native infantry. Inside there is a pagoda with beautiful stone carvings. A central jail has lately been built for 1,000 long-term prisoners, where excellent carpets, rugs, etc., are manufactured. Vellore was the scene of a mutiny in 1806, when the native sepoys rose and murdered 113 European officers and soldiers. The outbreak was promptly suppressed. It was supposed to have been instigated by the sons of Tippoo Sultan, who had been confined in the fort as State prisoners since 1799. They were forthwith removed to the neighborhood of Calcutta, where the last survivor died in 1875. Pop. (1901) 43,537.

**Vellozia,** a genus of plants of the natural order *Hæmodoraceæ;* natives of Brazil, Africa, Guiana, and Madagascar, and sometimes called tree lilies. They are perennials, with trunks closely covered by the withered remains of leaves, branching by forks, and bearing tufts of long, narrow, aloe-like leaves at the extremities of the branches. Some of them are from 2 to 10 feet high, and the trunk is sometimes as thick as a man's body. The structure of the trunk is very remarkable. It has a slender sub-cylindrical central column, of the ordinary monocotyledonous structure, outside of which are arranged great quantities of slender fibrous roots, which cohere firmly by their own cellular surface, and form a spurious kind of wood. The flowers of the larger species are about six inches long, pure white, yellow, blue, or purple.

**Velocipede,** a word applied to any kind of carriage driven by the feet and formerly to bicycles and tricycles. The name was first used in France, toward the end of the 18th century, when riding on the dandy horse became popular. The two wheels of the dandy horse were of equal size, connected by a bar, on which a saddle was placed, and astride of which the rider sat. The impetus was given by the rider's feet touching the ground, alternately pushing and being raised. Self-propulsion was next attempted by pulling levers with the hands or treading with the feet. In this kind of velocipede there were three wheels; but it never became very popular, on account of the labor. In the year 1868 the bicycle was introduced into the United States. This velocipede consisted of two wheels — as the name implies — of equal size. The rider sat on a saddle connected with the backbone, and propelled himself by pressing his feet on pedals at the ends of cranks which turned the wheel. It was a great improvement on the dandy horse; but, owing to the heavy weight of the machine, faulty bearings, and the vibration — which was so great that this form of the velocipede acquired the name of "bone-shaker" — the bicycle never became really very popular till

the introduction of the india-rubber tire.

The attention of manufacturers was now attracted toward further improvement. Mr. Starley, of Coventry, England, invented a light wheel, consisting of a steel rim, grooved for the reception of the tire, with stretched spokes of thin steel wire. This "tension" wheel was so light and graceful, yet strong that it at once superseded the old one, and virtually created the modern velocipede. The size of the hind wheel was reduced and the front one enlarged, and the bicycle was finally perfected by the invention of almost frictionless "ball-bearings," in which the spindles roll between free polished steel balls. The popularity and usefulness of the bicycle led manufacturers to improve the old three-wheeled velocipede by adopting the spider-wheel and ball-bearings, and the rotary pedal action. In these machines the pedals actuated a toothed wheel, which communicated the motion by a chain to another toothed wheel on the axle of the driving wheels. By varying the proportion of these chain wheels, a small wheel is made equal in velocity to a larger one, and this is termed the "gearing" of the machine (see TRICYCLE). Next came the SOCIABLE (*q. v.*); but, on account of its weight and cumbersomeness on the road and in stabling, it was soon displaced by the tandem. The velocipede known as a safety bicycle has two small wheels of the same size (or nearly so), the rider sitting well back from the front wheel, and thus possessing greater security from falling forward, and the requisite velocity is attained from the small wheels by the principle of "gearing up," adopted from the tricycle, the various classes of machines thus appropriating improvements from each other. One of the latest forms of velocipede invented is a tandem. See BICYCLE.

**Velocity,** in its full significance, involves the notion of direction of motion as well as that of speed or rate of motion. The notion of speed is a very familiar one. In measuring it we assume the possibility of measuring space and time; and the unit of speed is that speed which a moving point would need to have in order to pass over the chosen unit of space in a unit of time. Such phrases as four miles per hour, one mile per minute, 18 miles per second, are perfectly intelligible to all who know what a mile, hour, minute, and second are. It should be noted that when we speak of a man walking with a speed of four miles an hour we do not necessarily imply that he really completes four miles, or that he walks for one hour, but only that he would do so were he to keep up that speed for the time named. In fact, speed is an instantaneous property of the moving point. Again, since at every instant the moving point must be moving in a definite direction, as well as with a definite speed, it follows that velocity also is an instantaneous property. If it does not change from instant to instant, the velocity is constant, and the point moves in a straight line with constant speed. If the point moves in any other than a straight line, the velocity will be variable even although the speed should remain constant; and the most general change of velocity involves both change of direction and change of speed. Velocity is in fact a vector quantity, and may be treated mathematically as a VECTOR (*q. v.*).

The rate at which velocity changes is called acceleration. When the velocity changes in direction only, as when a point moves with constant speed in a circle, there is no acceleration in the direction of motion — *i. e.*, parallel to the velocity. The acceleration must therefore be wholly normal to the velocity, and will be toward the center of the circle in the simple case of uniform circular motion. If any change of speed occurs it is due to an acceleration acting parallel to the velocity, and therefore tangential to the path pursued by the moving point. When only a tangential acceleration exists, the point will move in a straight line with variable speed. A body falling vertically near the earth's surface gives a very good illustration of a pure tangential acceleration.

**Velum,** in anatomy, a veil, a partition; specifically, velum palati, the soft palate, a compound membranous septum, which prevents the food from ascending to the upper part of the pharynx. The term is also used of the anterior and posterior medullary valves of the cerebrum. In botany, the horizontal membrane which connects the margin of the pileus with the stipes of a fungus. Such a veil when adnate with the surface of the pileus, is called *velum universale* (a universal veil), and when extending only from the margins of the pileus to the stipes, *velum partiale* (a partial veil). In zoölogy, (1) a single or double ciliated lobe occurring in the young of some bivalve mollusks when they leave the parent. (2) An extension of the cephalic integument in the young of the Gasteropoda. It commences as a circle of cilia round the head. (3) The membrane which surrounds and partially closes the mouth of the disk of Medusæ or of medusiform gonophores.

**Velutina,** in zoölogy, a genus of *Naticidæ*, with four recent species from Great Britain, Norway, and North America. Shell thin, with a velvety epidermis; spire small, suture deep, aperture very large and rounded, no operculum. Margin of mantle developed all round and turned up over the shell; gills two, head broad, tentacles blunt, far apart, with eyes at their outer bases.

The animal is carnivorous. Three fossil species from the Pliocene of Great Britain.

**Velvet,** one of the most familiar of what are known as pile fabrics. It is produced by adding to the usual warp and weft threads of plain weaving an additional row of warp yarns which are woven into the ground of the cloth, and passed over wires on the surface. In the case of a loop pile the wires are simply drawn out, but for velvet or other cut pile a knife is first passed along a groove on the top of each wire to cut the pile before the wire is withdrawn. Real velvet is made entirely of silk, but a kind is made with a silk face on a cotton basis. The name velveteen is, however, extended to fabrics in which silk and cotton are mixed throughout. Some of the richest and most artistic of the many splendid textiles woven on Italian looms in the 15th and 16th centuries were made, in part at least, of velvet. Similar stuffs were also made in Spain and Flanders. Many of these were for ecclesiastical vestments, altar cloths, and the like, as well as for hangings. Plain velvets were likewise woven. The effect of a raised pattern in velvet on a plain or figured silk ground is often very beautiful. Sometimes a diaper design was formed of a long upon a short pile, called velvet upon velvet, and this too has a fine effect. Choice examples of these old velvet fabrics are preserved in some industrial art collections. Velvet is believed to have been first made in China. Modern velvets are largely made at Lyons and Crefeld.

**Velvet Swimming Crab,** the *Portunus puber;* a small crab with a hairy carapace, armed in front with 10 or more spines. Claws and four pairs of simple legs clothed with a dense pile of fur. General color brown, longitudinal ridges in the joints of the limbs blue. Called also the velvet fiddler crab.

**Venable, Francis Preston,** an American chemist; born in Prince Edward co., Va., Nov. 17, 1856; was graduated at the University of Virginia in 1879, and studied at the Universities of Bonn, Göttingen, and Berlin successively in 1879–1880, 1881, and 1889. In 1900 he was made president of the University of North Carolina and its Professor of Chemistry. His publications include "Manual of Qualitative Analysis" (1883); "Short History of Chemistry" (1894); "Development of Periodic Law" (1896); "Inorganic Chemistry According to Periodic Law" (with Prof. James Lewis Howe, 1898); etc.

**Venable, William Henry,** an American author; born in Warren co., O., April 29, 1836. He began to teach at 17, and taught till 1886, afterward devoting himself to literature and lecturing. He published: "June on the Miami, and Other Poems" (1871); "A History of the United States" (1872); "The School Stage," a collection of juvenile acting plays (1873); "Melodies of the Heart, and Other Poems" (1884); "Footprints of the Pioneers in the Ohio Valley" (1888); "Biography of William D. Gallagher" (1888); "Tales from Ohio History" (1896); "Santa Claus and the Black Cat" (1898); "Dream of Empire" (1901); several pamphlets, addresses, etc. He edited "The Dramatic Actor," a collection of plays (1874); and "Dramatic Scenes from the Best Authors" (1874).

**Venables, Edmund,** an English archæologist; born in London, England, in 1819. He was canon of Lincoln Cathedral from 1867, and wrote much on architecture and archæology, among his works being "Walks Through the Streets of Lincoln," widely popular; "History of the Isle of Wight" (1860); "The Church of England: Its Planting, Settlement, Reformation, Renewed Life" (1886); "Bunyan" (1888). He died in London, March 5, 1895.

**Vena Cava,** in anatomy, one of two veins, the inferior and the superior venæ cavæ. The inferior, lower, or ascending vena cava returns the blood from the lower limbs and from the viscera of the pelvis and the abdomen. A large valve, that of Eustachius, is situated at the orifice by which it enters the right auricle of the heart. The superior vena cava conveys to the heart the blood which is returned from the head, the neck, the upper limbs, and the thorax. It has no valves.

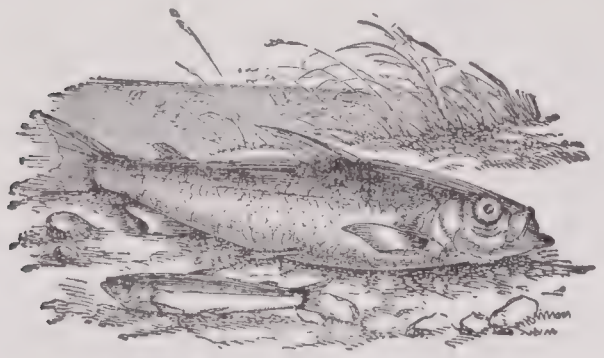
**Venantes,** in zoölogy, in Walcknäer's classification, a group of spiders which he defines as incessantly running or leaping about in the vicinity of their abode to catch their prey. The group was approximately equal to the more modern families *Mygalidæ, Salticidæ,* and *Lycosidæ.*

**Venasquite,** in mineralogy, a variety of Ottrelite, occurring in masses with a lamellar and radiating structure; hardness, 5.5; sp. gr., 3.26; color and streak, gray to grayish-black; composition, essentially a hydrated silicate of alumina and protoxide of iron.

**Venation,** the arrangement of the veins in the leaves of plants. If a leaf has only a single midrib without branches, as in many *Coniferæ,* the venation is said to be simple. The three leading types of venation are the reticulated, netted, or angular, found in the exogens and a few aberrant endogens; the parallel, or curved, found in all the higher endogens; and the furcate, or forked, characteristic of ferns. Lindley made 10 divisions: veinless, equal-veined, straight-veined, curve-veined, netted, ribbed, falsely-

ribbed, radiating, feather-veined, and hidden-veined. Professors McCosh and Dickie considered that they had traced a connection between the ramifications of plants and their venation.

**Vendace,** a species or variety of the large genus *Coregonus*, found in rivers and lakes of Sweden, and in the Castle Loch at



VENDACE.

Lochmaben in Scotland. It is popularly said to have been introduced at Lochmaben by Queen Mary; but the statement rests on no authority. Like most of its congeners, the vendace is a palatable fish. Its food consists chiefly of minute crustaceans. It generally swims in shoals, often with a remarkable separation of the sexes. It attains a length of 6–8 inches; the outline rises quickly from the snout to the dorsal fin, and the body tapers rather suddenly at the tail; the under jaw projects a little; the tail is deeply forked, and the dorsal and ventral fins are long. The back is brown, the sides tinged with yellow, the cheeks partly white, and there is a red heart-shaped mark between the eyes. The vendace spawns in November and December, and multiplies rapidly; but it is now scarce at Lochmaben.

**Vendée** (von*g*-dā′), **La,** a maritime department of Western France; bounded on the W. by the Bay of Biscay, on the N. by Loire-Inférieure, and on the S. by Charente-Inférieure; area, 2,588 square miles; pop. (1906) 442,777. The department, which owes its name to a small affluent of the Charente, is traversed from E. to W. by a range of hills, called in the E. the Plateau de Gatin, and in the W. the Collines Nantaises, and is watered in the N. by the affluents of the Loire, and in the S. by the Lay and the affluents of the Charente. Of its three divisions the W. is the Marais, occupied by salt marshes and lakes; the N. the Bocage, covered with plantations; in the S. and middle is the Plaine, an open and fertile tract. The coast line, 93 miles in length, presents few deep indentations, the chief being the safe Bay of Aiguillon.

**Vendée, La, War of,** the Royalist resistance to the French Revolution, which occurred chiefly in Vendée and Brittany. It broke out in Vendée, in March, 1793; gained a victory at Saumur, in June, 1793; but under La Rochejacquelin was decisively defeated by the Republican forces under Westermann and Marceau at Le Mans, Dec. 12, 1793. The struggle still went on in Brittany, under the name of the War of the Chouans; but was suppressed by General Hoche in 1796; and finally by Napoleon Bonaparte in 1800. The principal Vendean leaders were La Rochejacquelin, Cathelineau, Charette, and Stofflet. See CHOUANS.

**Vendemiaire** (von*g*-dā-myār′), the first month in the French Republican calendar, beginning Sept. 22 or 23, and ending Oct. 21 or 22; so called from its being the vintage season.

**Vendetta,** a particular case of the wider custom of blood-feud, by which every member of a stock, or body of men between whom blood relationship subsists, is bound to aid in taking vengeance (on the offender if possible, or on the stock to which he belongs) for a personal injury done to any of his kinsmen. The vendetta which exists in Corsica, and to a less extent in Sicily, Sardinia, and Calabria, is the practice of taking vengeance on the murderer of a relative; and this duty is imposed primarily on the next of kin, but in a less degree on all the relatives of the murdered individual. If the murderer succeeds in eluding his pursuers, then vengeance may be taken on any of his relatives. Between 1770 and 1800, when the vendetta was at its height, some 7,000 murders are said to have occurred in Corsica owing to this practice of private vengeance. A law prohibiting the carrying of arms did much to put a stop to the vendetta, but the law is now repealed with the result that the number of murders is on the increase.

**Véndôme** (von*g*-dōm′), a town of France; in the department of Loir-et-Cher; on the Loir; 42 miles N. N. E. of Tours and 111 S. W. of Paris. Above it rise the picturesque ruins of the castle of the Dukes of Vendôme, destroyed at the Revolution, and within the town is a fine 15th-century abbey church, with early Gothic tower and spire. Gloves and paper are made. Pop. (1901) 6,929.

**Vendôme,** an ancient countship of France; erected into a duchy by Francis I., for behoof of Charles de Bourbon, through whom it fell to his grandson, Henry IV., who again conferred it on César, the eldest of his sons by Gabrielle d'Estrées. César's eldest son, Louis, Duke of Vendôme, married Laura Mancini, one of Mazarin's nieces, and had by her three sons, the eldest of whom was the famous soldier, Louis-Joseph, Duke of Vendôme, called till his father's death the Duc de Penthièvre. He was born in Paris, July 1, 1654, and saw

his first service in the Dutch campaign of 1672. He next served with distinction under Turenne in Germany and Alsace, again in the Low Countries under Luxembourg, in Italy under Catinat, and received in 1695 the command of the army in Catalonia. He shook off his indolence, and closed a series of brilliant successes by the capture of Barcelona (1697). After five years of sloth and sensuality he superseded Villeroi in Italy, much to the delight of the soldiers. He fought an undecided battle with Prince Eugene at Luzzara (Aug. 15), then burst into the Tyrol, returning to Italy to check the united Savoyards and Austrians. On Aug. 16, 1705, he fought a second indecisive battle with Prince Eugene at Cassano, and at Calcinato he crushed the Austrians (April 19, 1706). That summer he was recalled to supersede Villeroi in the Low Countries under nominal command of the Duke of Burgundy. The defeat at Oudenarde (July 11, 1708) cost him his command, but in 1710 he was sent to Spain to aid Philip V. His appearance turned the tide of disaster; he brought the king back to Madrid, and defeated the English at Brihuega, and next day the Austrians at Villaviciosa. After a month of gluttony beyond even his wont, he died in Tinaroz, in Valencia, June 11, 1712. Saint-Simon hated Vendôme, and has gibbeted to all eternity his sloth, his gluttony, and his shameless debauchery.

**Venedey, Jakob** (ven'e-dī), a German writer; born in Cologne, May 24, 1805. After sharing in the celebration at Hambach (1832), he lived long as an exile in France; was a member of the Frankfort Parliament of 1848. He wrote: "Days of Travel and Rest in Normandy" (1838); "France, Germany, and the Holy Alliance" (1842); "Germans and Frenchmen According to Their Languages and Their Proverbs" (1842); "John Hampden" (1843); "Ireland" (1844); "History of the German People" (4 vols. 1854–1862); "Machiavelli, Montesquieu, and Rousseau" (2 vols. 1850); "Frederick the Great and Voltaire" (1859); "Biographies" of Washington (1862), Franklin (1863), Stein (1868); "The German Republicans Under the French Republic" (1870). He died in Badenweiler, Feb. 8, 1871.

**Venediger** (-nā'dig-er), **Gross**, one of the highest peaks of the Eastern Alps, famous for the beautiful view from its summit. It is situated on the frontier of Tyrol and Salzburg, W. of the Grossglockner. Height, 12,005 feet.

**Veneer**, beautifully grained or figured woods which are, owing to their cost, rarely used in the form of solid boards, but cut into thin slices. Veneers are cut from almost all the finer woods, both native and foreign, including mahogany, birch, rosewood, ebony, satinwood, cedar, tulipwood, Hungarian ash, sycamore, and others, veneers being used on pianos and other musical instruments, on furniture, doors, and so on. Some veneers are sawed and some are cut from the log by means of a knife. The sawed veneers are the better and more desirable, and they cost twice as much as cut veneers. More cut veneers are used however. Some woods can be worked for veneers under the saw only; some can be either sawed or cut, and of such both kinds of veneers are made; but there are woods that practically are made in knife veneers only.

Veneers may be made of almost any degree of thinness, as, say, one one-hundredth of an inch. They are most commonly made for the many uses to which they are put, in sawed veneers of a thickness of 26 to 30 to the inch, and in cut veneers of a thickness averaging 30 to the inch. Of sawed veneers of such thickness but 12 to 13 can be produced from an inch of solid wood; the rest is lost in sawdust. There is no waste of material in making cut veneers. Sawed veneers are cut, a single sheet from the log at a time, by a circular saw of between five and six feet in diameter, of a kind specially made for the purpose. The inner side of this saw, that is, the side toward the body of the log, is flat; the outer side of the flange, which is the disk of the saw, to which the teeth are attached, is made slightly concave, so as to throw the veneer a little clear of the saw as it comes along; if it were permitted to hug the saw, the thin sheet of wood would be burned or scorched by the friction. The saw is, of course, adjusted to run with the greatest nicety, and the squared log that is to be sawed into veneers is rigidly secured to the frame that carries it to the saw.

The cut veneers are shaved off on a simple but powerful and costly machine called a slicer, in which the log, securely held on a moving frame is brought against a knife held rigidly. The knife of a slicer is perhaps 17 feet in length, made in two parts each 8½ feet in length, but perfectly joined, making one continuous knife 17 feet long. The knife is set horizontally, edge upward, in the face of what is called the knife bed, which is a ponderous casting immovably set. Extending along over the top of the knife bed, and above the level of the knife edge is a massive casting called the cap. Attached to the front of the cap horizontally, just above the knife edge, parallel with it and adjusted at a line back from it the thickness of the veneer that is to be cut, is what is called the pressure bar. The knife and the pressure bar, so held, constitute in effect a gigantic plane, which is not moved to cut the thick shaving that it is made to

produce, but which is held securely while the log from which the shaving is taken is brought against it.

The squared log from which the veneers are to be cut is rigidly secured horizontally by means of clamps to the face of what is called a staylog, this being in effect a log frame that is placed horizontally, but with its face in a vertical position and opposite to that part of the machine in which the knife is held. There are many slats along in the staylog, at the top and bottom of which are clamps that are moved in their openings as may be required to clutch and hold firmly the log stretched along its face. The staylog moves in a vertical plane, but in a diagonal direction, on heavy slides.

Motion is communicated to the staylog by means of an arm attached to a rocker shaft, which thrusts the staylog upward and pulls it down on the slides with regular alternations. The motion of the staylog being diagonal in its direction, the wood is brought against the knife with a slicing movement. The staylog is adjustable with relation to the knife by means of a wheel something like a steering wheel, set at one end of the staylog apparatus. To one unaccustomed to it the operation of the slicer seems almost marvelous. The staylog is thrust upward on the slides and drawn downward about as rapidly as a man would work a jackplane.

**Veneridæ,** in zoölogy, a family of *Sinupallialia*, with several genera, universally distributed, but most abundant in the tropics. Shell regular, closed, suborbicular, or oblong; ligament external; hinge usually with three teeth in each valve; muscular impressions oval, polished; pallial line sinuated. Animal free, locomotive, rarely attached by a byssus or burrowing. The shells of all the family are remarkable for elegance of form and color, and are frequently ornamented with chevron-like markings. Their texture is hard, all traces of structure being usually obliterated. They appear first in the Oölite, attaining their greatest development in the present day.

**Venerite,** in mineralogy, a greenish earthy substance, which the microscope shows to consist of minute scales; occurs in layers in schist at Springfield, Berks co., Pa. An analysis yielded: Silica, 28.93; alumina, 13.81; sesquioxide of iron, 5.04; protoxide of iron, 0.27; protoxide of copper, 16.55; magnesia, 17.47; water, 12.08; insoluble, 6.22 = 100.37.

**Venerupis,** in zoölogy, a genus of *Veneridæ*, with about 20 recent species, widely distributed, and living in crevices of rocks. Shell oblong, radiately striated, and ornamented with concentric lamellæ; three small teeth in each valve. Fossil species occur in the Miocene of Europe and the United States.

**Venesection.** See PHLEBOTOMY.

**Venetian Architecture,** a variety of the Gothic style, of which examples are found mainly in palaces which form a class apart among buildings constructed in the Italian Gothic style. In these palaces the arches of the windows and halls rest upon shafts, and terminate in intricate designs of open tracery work, as in the case of the celebrated Palace of the Doges. The arches have a wavy shape, which gives them an Oriental appearance. The enrichments, moreover, display, as they usually do in Italy, different mode of treatment from that which prevails elsewhere in the Gothic style. The corners of the façades are marked by slender shafts twisted like cables. The moldings and cornice consist merely of narrow bands, which generally rest on consoles. A method of decoration peculiar to these buildings appears to have been borrowed from Byzantine models; fine marbles of various colors, of which red porphyry and green serpentine are the most frequent, are inserted in circular and angular panels and borderings, and form a sort of mosaic work. This style of ornamentation is employed both in churches and palaces.

**Venetian Red,** a color said to be a native ocher, but the colors sold under this name are prepared artificially from sulphate of iron, or its residuum in the manufacture of acids. They are all of redder and deeper hues than light red, are very permanent and have all the properties of good ochers. Scarlet ocher, Prussian red, English red, and rouge de Mars are other names for the same pigment.

**Venetian School,** a school of painting which arose and declined in the 16th century, and of which Titian (1477–1576) is considered the founder. Among its other masters were Giorgione (1477–1511), Tintoretto (1512–1594), and Paul Veronese (1528–1581). The distinguishing characteristics of this school were a mastery of color and a consummate knowledge of chiaro-oscuro.

**Venezuela,** a republic in the N. W. part of South America; bounded on the N. by the Caribbean Sea; on the W. by the United States of Colombia; on the S. by Brazil; and on the E. by British Guiana; lat. 1° 20′ to 12° 25′ N., lon. 59° 54′ to 73° 17′. Within recent years the country has been variously subdivided. In 1854 there were 13 provinces — those of Apure, Barcelona, Varinas, Barquisimeto, Carabobo, Caracas, Coro, Cumana, Guiana, Maracaibo, Margarita, Merida, and Truxillo — with an aggregate population of 945,908. Subsequently, the number of provinces was increased

to 21 by subdividing eight of the original provinces. In 1863, after the Federals had conquered the Unionists, a confederation was formed, and the number of States was reduced to seven. The present distribution, according to the constitution of 1904, is into 13 States, a Federal district, divided into two sections, and 5 territories. The area of the country claimed and occupied by Venezuela is 364,000 square miles; pop. (1908) 2,664,241. The capital is Caracas; pop. 72,429.

*Topography.*— The coast line extending from E. to W.— from the delta of the Orinoco to the boundary of the United States of Colombia — is 1,584 miles in length. Venezuela comprises the plains of the Orinoco basin, in continuation of the Amazon valley around the mountains of Guiana, partly separated from the Caribbean Sea by the N. E. range of the Andes. These plains are traversed by many rivers, the main river being the Orinoco, into which flow the Caroni and Ventuari, traversing and draining with their affluents the Guiana Mountains; the Atabapo, and other rivers. The Upper Orinoco is connected with the Upper Amazon by the channels of the Cassiquiare and the Rio Negro. The mountain system of the Andes extends N. and E. into Venezuela from Colombia. Between the N. and E. ranges is the low country of Lake Maracaibo basin. The country E. of this basin is an extensive mountain tract, some of the peaks reaching above the limit of perpetual snow. These mountains extend along the N. coast, in a double range, having fertile valleys between. There are other mountain ranges in the S. and E. The highest peak is the Sierra Nevada de Merida, reaching a height of 15,400 feet. Lake Maracaibo, in the extreme N. W., has an area of 8,392 square miles, and is connected by an outlet 8 miles wide, with a gulf of the same name; the waters of the gulf and lake together forming an inland waterway that penetrates the country more than 300 miles.

*Climate.*— The climate is tropical, and very hot in the valleys, the regions of the Lower Maracaibo basin being the hottest found on the W. continent. Above an altitude of 2,000 feet the climate becomes temperate, and cold above 7,000 feet. Much of the mountainous and plateau country has an elevation between these altitudes. The mean temperature at La Guira is 82°, at Caracas 77°, but at Merida 61°. Wet and dry seasons alternate on the table-lands. Rain is abundant in the mountain regions.

*Zoölogy.*— Large regions of Venezuela, especially in the S. W. comprising the Upper Orinoco basin and plains, are still unexplored, much of the country being densely covered with forests, penetrable only with great difficulty. Fully one-half of Venezuela is unbroken forest. These forests abound in wild animals, insects, birds, and reptiles. There are many species of monkeys, all the varieties of South American *Felidæ*, tapirs, deer, ant eaters, the spectacled bear, the cabaiai sloths, etc. Aquatic birds in enormous flocks are found in the swamps, lakes, and rivers. Tortoises are plentiful, 50,000,000 eggs annually being taken for their oil. Manatees and porpoises ascend the Orinoco. The rivers, bays, and lakes abound in fish of many varieties.

*Agriculture.*— Agriculture is the principal industry, but is mostly confined to the N. mountainous belt, where the greater part of the population is concentrated. The principal products are coffee, cacao, sugar cane, tobacco, maize, cotton, and tropical fruits. Wheat is cultivated in some of the higher plains. Indigenous products, cultivated or gathered, include the tonka bean, rubber, copal, sarsaparilla, chinchona, many beautiful cabinet woods, dyewoods, herbs, drugs, etc. The agricultural lands amount to about 135,000 square miles. Great herds of sheep, goats, and cattle are raised on the table-lands and mountain slopes, the export of hides and skins forming an important industry of the country.

*Mineralogy.*—Venezuela has important gold mines. The El Callao mines has a maximum annual yield of over $3,000,000. Copper, coal, salt, asphalt, silver, lead, tin, iron, sulphur, and petroleum are also found. Guano is exported, and bitumen is found in the river deltas and lake basins.

*Commerce.*— In 1897–1898 the imports amounted in value to $8,689,840, and in the preceding year the exports aggregated $18,547,700. In 1898 the United States imported from Venezuela commodities to the value of $7,722,564, and exported thereto various articles aggregating $2,704,908. Among the United States imports was coffee to the value of $6,171,043. Coffee constitutes about three-fourths of the entire export trade, and nearly six-sevenths of the import trade is subject to duty.

*Finances.*— The foreign debt of Venezuela began with its assumption of its share of the old Colombian debt of 1834. On July 1, 1898, the total of the foreign debt was $22,939,500, and on Dec. 31, 1898, the total of the internal debt was $15,956,700.

*Communications.*—The country is poorly provided with railroads. In 1899 there were 529 miles in operation; in 1898, 3,382 miles of telegraph line, with 113 telegraph offices, two telephone companies, and 214 postoffices. The common roads are mostly execrable. The chief channels of intercommunication are the rivers. There are regular steamboat lines up and down the Orinoco and a great deal of short distance travel is accomplished by small craft. There is steam and telegraph communication with Europe and with the United States.

*Government.*— The government of Venezuela is a federative republic, having a President, elected for six years, and a Congress of two houses. The government is modeled after that of the United States, but the administration is unstable, and changes and revolutions have been frequent.

*Religion.*— The State religion is Roman Catholic, but all other religions are freely tolerated. There are government universities at Caracas and Merida. There are also, chiefly at Caracas, special colleges, seminaries, military schools, and normal schools, a national library, museum, and observatory.

*History.*— The E. coast of Venezuela was discovered by Columbus in 1498; Ojeda and Vespucci followed in 1499, and, entering Lake Maracaibo, they found an Indian village constructed on piles, to prevent the evil effects of inundation, and they named the place Venezuela, or Little Venice, a name which afterward spread to the whole country. The first settlement was made at Cumana in 1520 by the Spaniards, and Venezuela remained subject to Spain till it claimed independence in 1811. It then returned to allegiance to Spain, but again revolted in 1813, and, forming with New Granada and Ecuador the republic of Colombia, was declared independent in 1819. In 1830 Venezuela withdrew from the other members of the Free State founded by Simon Bolivar and declared itself a federal republic. The charter of fundamental laws date from 1830, were amended in 1864 and 1881, and are quite similar to the Constitution of the United States of America, but permit more independence in local government. The most notable events in recent years were the boundary dispute with Great Britain, settled by arbitration in 1899, and the claims dispute with England, Germany, and Italy referred to the Hague Tribunal, in 1903. See VENEZUELAN BOUNDARY DISPUTE.

**Venezuela, Gulf of.** See MARACAIBO, GULF OF.

**Venezuelan Boundary Dispute.** In 1855 a crisis arose between Great Britain and Venezuela regarding the boundary line separating the latter country from British Guiana — a question which had been long in dispute. The controversy dated back to 1814, when Great Britain acquired by treaty with the Netherlands the provinces of Demerara, Essequibo, and Bernice. Venezuela originally claimed her limits to be those of the captaincy-general of 1810, but contented herself with claiming the line of the Essequibo river as the true boundary. Great Britain apparently acquiesced till 1840, when she commissioned Sir R. Schomburgk to lay out the boundaries, which he proceeded to do by including a large area which had before been considered by Venezuela a portion of her domain, and to the possession of which by Great Britain a vigorous protest was entered. After much diplomatic negotiation the monuments set up by Schomburgk were removed by the order of Lord Aberdeen. Other boundaries were from time to time suggested, but none agreed on, till finally, in 1886, Great Britain returned to her contention of 1840, and claimed all the territory within the Schomburgk line. The controversy continued till 1894, when a Venezuelan force entered the disputed territory and raised the flag of the latter country at Yuruan. The following year the British police removed the flag, for which they were arrested but finally released, Great Britain setting up a demand for reparation somewhat in the nature of an ultimatum.

The United States became a party to the dispute by the act of Congress directing the President to urge Great Britain to submit to arbitration the question whether Venezuela was entitled to the territory between the Essequibo and the Orinoco. In his annual message to Congress, Dec. 3, 1895, President Cleveland called attention to the boundary controversy and the representations made by the United States government to that of Great Britain with a view of securing the submission of the dispute to arbitration. On the 17th he sent a special message to Congress, accompanied by the answer of the British government to the representations mentioned, and a recommendation that Congress authorize the appointment of a commission to determine the divisional line between Venezuela and British Guiana. The message created intense excitement throughout Europe and America. Both Houses of Congress passed a commission bill unanimously and indulged in much talk of war. Under the bill the President announced, Jan. 1, 1896, the appointment of the following commissioners: David J. Brewer, Associate-Justice of the United States Supreme Court; Richard H. Alvey, Chief-Justice of the Court of Appeals of the District of Columbia; Andrew D. White, ex-United States minister to Russia; Frederick R. Coudert; and Daniel C. Gilman, president of Johns Hopkins University. Subsequently the commission organized and chose Justice Brewer its president.

The commission invited the governments of Venezuela and Great Britain to formulate and present to it their respective cases in support of their claims. The invitation was complied with by both governments. Independently of these cases the commission gathered a great mass of evidence bearing on the claims, and continued its sittings till Feb. 27, 1897, when, Venezuela and Great Britain having signed a treaty providing for the submission of the claims to arbitration, the commission considered its work at

an end, made its report to the President, and terminated its existence. The treaty between Venezuela and Great Britain was signed in Washington, D. C., on Feb. 2, 1897, and provided for the appointment of an arbitration tribunal, to determine the boundary line, consisting of five jurists, the two on the part of Venezuela being Chief-Justice Fuller and Associate-Justice Brewer of the United States Supreme Court; the two on the part of Great Britain being the Rt. Hon. Baron Herschell and the Hon. Sir Richard Henn Collins; and the fifth to be selected by the four jurists nominated in the treaty, or, in the event of their failure to agree, by the King of Norway and Sweden, the fifth jurist to be the president of the tribunal. The treaty provided that the tribunal should sit in Paris, France. The tribunal was completed by the selection of Professor Maertens, a distinguished Russian jurist, Professor of International Law in the University of St. Petersburg, and legal writer, as the fifth member and president. The award of the tribunal, which was delivered Oct. 3, 1899, gave Great Britain the Schomburgk line, with the exception of Barima Point, at the mouth of the Orinoco, and a strip of territory between the Wenamu and Cuyuni rivers; but it was decided that the mouth of the Orinoco should be open to the British, and both banks of a part of the Cuyuni, where the Schomburgk line had given them only one bank.

**Venial Sin.** The distinction made in Roman Catholic theology between mortal sin and a venial sin was first made in connection with Church discipline. St. Augustine, in his book of "Faith and Works," distinguishes sins into two kinds; greater, or those which obliged men to do public penance, and which he called mortal; and lesser, such as sins of the tongue and thoughts, and the immoderate use of lawful things, which he called venial, not because they were not mortal in their own nature, but because in comparison with the others they were of an inferior nature, and not so easily proved on men; and because men were cleared from them without the humiliation of a public penance, by private repentance, and daily prayer and reformation. The same distinction is made in the writings of many of the early Fathers. The sins for which public penance had to be undergone were all enormous sins, such as idolatry, apostasy, divination, murder, adultery, theft, and sacrilege. But this is not the distinction which is made in later theology in connection with the doctrines of purgatory and auricular confession, and especially in the writings of the casuists. There is so much diversity of opinion among the writers themselves that no precise definition of a venial sin can be given, farther than that they are those minor sins to which even the best are liable, and from which even those who escape the punishment of hell have to be purified in purgatory before they can enter to heaven.

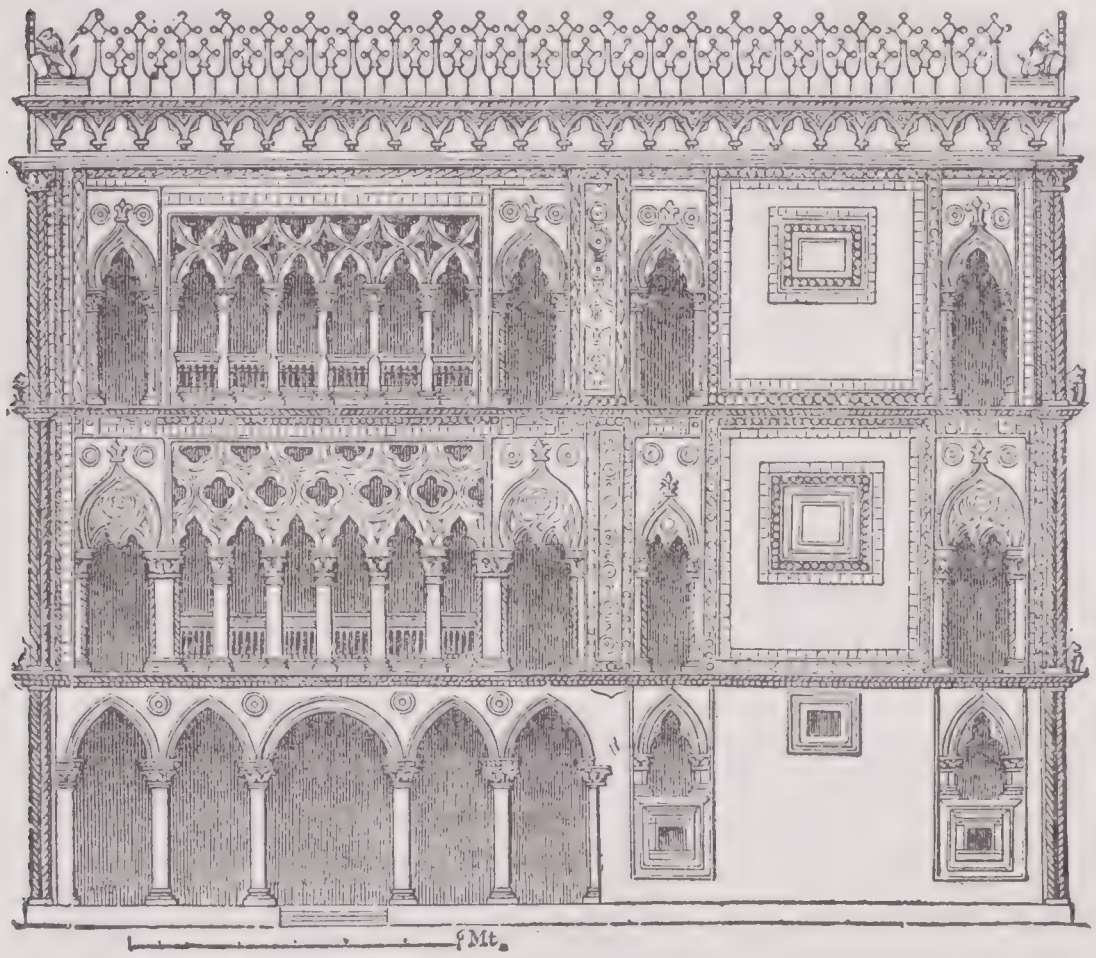
**Venice** (Italian, Venezia), a province of Northeastern Italy; bounded S. E. and E. by the Adriatic Sea, and remarkable for its long series of lagoons, which, stretching due N. for 25 miles from the mouth of the Brenta to that of the Sile, occupy a considerable part of the old bed of the Piave; area 934 square miles; pop. (Jan. 1, 1909) 443,804. The lagoons contain numerous small islands (on some of which the city of Venice itself stands (that are separated from the open sea by a peninsula which is partly composed of the alluvium brought down by the rivers, and partly of the sand thrown up by the waves. Being, however, intersected by both artificial and natural channels, access to the coast, as well as to the capital, is thereby obtained. Products, all kinds of cereals, with rice, maize, hemp, silk, and wine.

**Venice,** a celebrated city of Northeastern Italy, capital of the above province and of the former Venetian republic; near the N. extremity of the Adriatic, 70 miles W. of Trieste. The city is built entirely on piles driven into about 80 small islands situated in the shallow waters of the Bay of Venice, and known as the lagoons, a kind of lake shut out from the deeper water of the Adriatic Sea, by a ridge or long but interrupted belt of sand and earth called the Littorale, which extends about 2 miles from the shore, shutting in all the islands and lagoons from the Adriatic Sea. A modern viaduct, supported on 222 arches, part of the Verona and Venice railway, has lately united the continent with the Littorale or protecting beach of the city. The 80 islands on which the city is built are separated from each other by narrow channels, which serve the purpose of thoroughfares, being constantly traversed by gondolas, a light river boat, answering the purpose of cabs and omnibuses, and depositing passengers at any house or building at which they may desire to alight. The whole series of islands are connected with each other by means of 450 bridges. Some of the islands are large enough to have what may be regarded as two or three short streets with intersecting lanes or alleys, but in general they only present blocks of buildings, having river fronts, according to the direction of the canal, or the water frontage of the isle. The longest and most important street in Venice, the Merceria, is only 15 feet wide; carriages and horses are unknown in Venice, the gondola being the universal means of transit to those going from shop to shop or house to house.

Venice is nearly 8 miles in circumference, contains about 28,000 houses, and is divided

Venice

into two parts by the Grand Canal, or Canal Grande. Over this canal there is only one bridge, that of the Rialto, the most magnificent bridge in Venice, consisting of a single arch 90 feet in span and 24 feet in height, built of marble in 1590. Two ranges of shops divide its upper surface into three narrow parallel streets. Venice is regarded as one of the finest cities in Europe, and was for many centuries the capital of the first maritime and commercial state in the world. It consequently contains proportionally a larger number of public buildings and palatial residences than any other city in Europe; among the most celebrated of its national edifices, first mention must be given to that stupendous building, the pride and glory of Venice, the ducal palace of St. Mark, with the cathedral of St. Marco, forming three sides of a square, the grandest and most imposing quarter of all the city. The square of St. Mark — with its arcades, its fine and elegant shops and cafés, the vast grandeur of its ducal residence containing all the chambers of state, audience, and judicature, and its magnificent cathedral — presents a picture of grandeur and beauty unequaled by any capital in Europe. The Bridge of Sighs (*Ponte dei Sospiri*) stretches across the canal called the Rio Palazzo, and communicates between prisons on the E., and the Doge's palace on the W. bank of the canal. It is a covered gallery; and prisoners, when led to execution, passed from their cells across this gallery to the palace, to hear sentence of death passed upon them, and then were conducted to the scene of death between the red columns.




VENICE: THE HOUSE OF GOLD.

Few cities in Italy are richer in works of pictorial art than Venice; some of the masterpieces of Titian, Tintorretto, Paul Veronese, and the other great chiefs of the Venetian school, are to be found in all the churches of this extraordinary city. The library (a fine marble structure, containing 120,000 volumes and 10,000 MSS.), the museum, and cabinet of curiosities of St. Mark's, are regarded as the finest in Europe. The arsenal and dockyard are esteemed as worthy objects of attraction; the latter, in the palmy days of Venice, contained 40 line-of-battle ships, 12 of them three-deckers, with arms for 150,000 men, 4,000 pieces of ordnance, and an immense amount of naval and military store, with provision and every requisite to maintain its reputation as one of the first commercial and maritime states in the world. For many centuries, in the Middle Ages, Venice had the monopoly of all the glass sold to Europe; but this has long since passed away, and its chief trade is now confined to the manufacture of mirrors, jewelry, artificial pearls, silks, velvets, and porcelain.

The foundation of Venice was laid in 421, as a place of refuge during the invasion of Italy by Attila. In 697 took place the establishment of an elective prince or Doge, with the appellation of Serene Highness — Paoluccio Anafesto being the first Doge or Duke of Venice. At first the power of the Doge was absolute, but in time restrictions were placed on his rule, till eventually he became a mere cipher and symbol of authority in the hands of the famous Council of Ten. The prosperity and power of Venice began with the dawn of the 9th century. In 1133, the Doge Sebastino received from Pope Alexander III. the title of Sovereign of the Adriatic, in consequence of a signal victory gained by the Venetian galleys over the fleet of the emperor, when, further to mark his joy at the

victory, the Pope flung into the gulf a ring of great cost, as a mark of gratitude — a custom afterward annually followed by the Doges, who, in great state, dropped a rich ring into the sea; this ceremony was called, espousing or wedding the Adriatic. In the reign of Giovanni, in 1620, gold was first coined in Venice, the coin from the ducal dignity of the prince being called a ducat. Venice at this time was at the height of its glory as the first maritime and commercial state in Europe, as the most prosperous of nations, and as a leading military and political power. Jealous of the rising influence of the republic of Genoa, already encroaching on the commerce of the East, with Venice considered as her exclusive monopoly, she for more than a century carried on a harassing war with her rival, sometimes with serious loss, at others with advantage. In 1396 Genoa placed herself under the dominion of the King of France, and therefore ceased to have a separate existence as an enemy of the republic. The greatest part of the 15th century was passed in repeated wars with the Turks, who captured many of her Greek and Ionian islands, especially Cyprus, and large portions of Dalmatia. When the commerce of Venice became annihilated by the discovery of the route to India by the Cape, petty quarrels and political jealousies occupied the Venetians, instead of commerce and dominion. From this time the prestige of Venice declined, and her power gradually sank as a state till, on the occupation of Italy by the armies of the French Republic, Venice — after an independent existence of 1,300 years — without striking a blow became a part of Napoleon's Cisalpine republic, and afterward of the Italian kingdom. At the Congress of Vienna, 1815, Venice was annexed to Austria. The city and territory were ceded to, and incorporated with, the kingdom of Italy in 1866. Pop. (1909) commune, 160,000.

**Venice, Gulf of,** an arm of the Adriatic Sea, on the N. E. coast of Italy, bounded by the Brenta and the Piave.

**Venice, Little.** See LITTLE VENICE.

**Venice of France,** Amiens. See LITTLE VENICE.

**Venice of the West,** Glasgow, in Scotland, — a name for which it is difficult to see any reason.

**Venice Turpentine,** a ropy liquid, colorless or brownish, inclining to green; having an unpleasant odor and bitter taste. It is obtained from *Terebinthina venetia*, and is said to be contained in peculiar sacs in the upper part of the stem. According to Unverdorben it contains in the fresh state two different oils, one easily becoming resinous, also two acid resins, a neutral resin and succinic acid.

**Veni Creator Spiritus,** an ancient and celebrated hymn of the Roman Breviary, which occurs in the offices of the Feast of Pentecost for Vespers and Tierce, and in the Pontifical for the Ordination of Priests, Consecration of Bishops or of a Church, the "Ordo ad Synodum," and some other solemn services. Its authorship has been ascribed to Charlemagne, also to Gregory the Great, St. Ambrose, or Rabanus Maurus. It was translated by Bishop Cosin, again by Dryden, whose version was adapted by John Wesley and Toplady. The labors of more than 30 later translators have not stripped this noble hymn of all its dignity. The Veni Creator Spiritus must not be confounded with another hymn to the Holy Ghost, Veni Sancte Spiritus, Et emitte coclitus, the "Golden Sequence," which ranks among the masterpieces of Latin sacred poetry. The latter belongs not to the Breviary, but to the Missal, in which it forms a Sequence in the Mass of Pentecost Sunday and Octave. It is in five stanzas, each consisting of six lines of seven-syllable trochaic verse. It is certainly not older than the beginning of the 13th century. It has been variously ascribed to King Robert II. of France, to Hermannus Contractus, to Stephen Langton, and, with perhaps most probability, to Pope Innocent III. The best translations are those by Caswall and by Neale.

**Venilia,** in entomology, a genus of geometer moths, family *Ennomidæ*. The antennæ simple in the males; fore wings slightly indented below the tip; hind wings entire. *V. maculata* is the sole European species.

**Venire Facias** (ve-nī'rē fā'shyas) (Latin, "that you cause to come"), in law, a writ or precept directed to the sheriff, requiring him to cause a jury to come or appear in the neighborhood where a cause is brought to issue to try the same. This writ was abolished in England in 1852, but the precept issued by the justices of assize, which is substituted, is sometimes loosely spoken of as a *venire*.

**Venitia,** a compartimento of the kingdom of Italy; comprising eight provinces in the N. E. part. The capital is Venice. Pop. (Jan. 1, 1909) 3,461,924.

**Venlo,** or **Venloo,** a town of the Netherlands, in Limburg, on the Meuse, at the junction of several railways. In its earlier days it was strongly fortified and was the scene of many sieges and battles, having been at different times in the possession of

France, Holland, England, Austria, Belgium, and the Netherlands. Its principal industries are the manufacture of tin, lead, and tobacco, together with brewing and tanning. Pop. (1900) 14,399.

**Venn, Henry,** an English clergyman; born in Barnes, Surrey, March 2, 1724. He studied at Jesus College, Cambridge, taking his degree in 1745, and became Fellow of Queen's College in 1749. After holding several curacies he was appointed to that of Clapham in 1754, but resigned in 1759 to become vicar of Huddersfield in Yorkshire, whence in 1771 he removed to the vicarage of Yelling in Huntingdonshire. The holiness of his life, his broad sympathies, and earnest zeal gave him wide influence even in that barren and unspiritual age. He was an indefatigable preacher, often delivering as many as 10 sermons a week. His two books were "The Complete Duty of Man" (1763), and "Mistakes in Religion" (1774). He died in Clapham, June 24, 1797.

**Vennor, Henry George,** a Canadian meteorologist; born in Montreal, Canada, Dec. 30, 1840. He was attached to the Geological Survey office till 1881. He published "Vennor's Almanac" from 1876, which attained a large circulation; and wrote "Our Birds of Prey" (1875), and many reports for the Geological Survey and the "Canadian Naturalist." He died in Montreal, July 8, 1884.

**Venomous Animals,** animals capable of inflicting poisonous wounds by means of special organs or contrivances. They include spiders, bees, wasps, hornets, scorpions, certain serpents, etc. In all cases the venomous matter must be introduced directly into the circulation to produce its effects.

**Venosity,** the quality or state of being venous. In pathology, a somewhat morbid condition in which the blood appears to move more slowly than usual, all being more venous, and having the specifically venous blood in larger proportion than in a state of perfect health.

**Venous Blood,** blood from the veins. It is of a purple color through deficiency of the hæmoglobin. It contains 8 to 12 per cent. less oxygen and 6 per cent. more carbon dioxide than arterial blood.

**Venta Belgarum.** See WINCHESTER.

**Ventail,** the lower movable part of the front of the helmet, which admitted air for breathing, the upper being the VISOR (*q. v.*). It succeeded the nasal of the 11th century, and the term was afterward applied to all defenses of the face, whether a combination of the mail hood or a plate attached to the front of the helmet.

**Ventignano, Cesare Della Valle Duke of,** an Italian poet; born in Naples, Italy, in 1777. Among his works are the tragedies "The Siege of Corinth" and "Medea"; an "Essay on the Education of the Aristocracy and the Laboring Classes"; and a "Philosophic View of the History of the Human Race" (1853). He died about 1860.

**Ventilago,** in botany, a genus of *Rhamnaceæ*. Tall climbing shrubs with woody branches, leathery leaves, and small panicles of flowers. They are all from the tropics of the Eastern Hemisphere. *V. maderaspatana*, an extensive climber, with green, offensively smelling flowers, a native of Central and Southern India and Burma, is said to yield a gum. The root bark yields a red dye, orange and chocolate with *Oldenlandia umbellata*, and black with galls. The fibers of the bark constitute excellent cordage, and, according to Rumphius, the Amboyna fishermen employ the long stems instead of ropes.

**Ventilation,** the artificial renewal of the air within a confined space, such as a mine or the interior of a building or vessel. This is required when the air is subject to contamination, as by products of respiration or by admixture with other gases. In a mine it is necessary to renew the air in order to carry off the products of respiration of men and horses, the products of combustion of lamps, and, in coal mines, the inflammable gas which oozes from coal or rushes from "blowers," and causes risk of explosions. In general there are two leading methods of ventilation: (*a*) causing air to go out at the outlet, and allowing air to find its way in by any inlet (vacuum method); (*b*) forcing air in and allowing it to find its way out (plenum method). The advantage of the second method is that it is known whence the air comes which is forced in, and the access of air from other sources tends to be prevented by the excess of pressure within the confined space. In most cases, however, the vacuum method, on account of its simplicity, is much more easily applied.

In mines there are two main methods of applying the vacuum method: (*a*) by a furnace at the bottom of the upcast shaft; (*b*) by a vacuum fan at the top of that shaft. In both cases the actual quantity of air which is caused to travel up the upcast shaft must be sufficient to sweep away and sufficiently dilute all the mischievous admixtures in the workings; and the "draught" must be sufficient to overcome the very considerable friction encountered by the air as it passes through the air ways. This friction varies at each spot as the square of the velocity there; and therefore it is necessary to arrange the

air ways so as, with a given flow, to have the least velocity possible upon the discharge into the outer air. When a furnace is used, air is heated by it and becomes light; it therefore tends to ascend in the shaft; other air takes its place in the workings; and a continuous current is thus set up, the fresh air entering by the downcast shaft. A furnace is, however, somewhat dangerous, for the air from the workings may, on reaching it, be unsafely charged with gas and coal dust; and during recent years powerful exhaust fans, like centrifugal pumps, have been largely employed. The velocity for a given flow is lowest when the air ways are wide, and the velocity at any point of the workings is less the more numerous the air ways. The flow through the workings is regulated by opening and closing air doors or putting up barriers. If the flow through the workings is too much obstructed, the actual outflow of air being maintained by driving the engine hard, the pressure within the air ways may be so far diminished that gas is exhausted from the coal seam. In mines water gauges are employed in order to test the local pressures in the workings; one limb of a U tube containing a little water is connected with the "dumb drift," and thereby with the upcast shaft; the other limb is open to the air way; the movement of the water in the U tube, taken along with the readings of the instruments in the upcast shaft, indicates the suctional variations of pressure in the workings. The velocity is measured by anemometers, which are often made to signal their readings by electric transmission. Barometers and thermometers are also used in order to supply data for the requisite corrections and adjustment of quantity of air to be set in motion. Besides furnaces and fans, steam and air blasts have been used in order to force air along; but these waste much power. In ore mining the fresh and chilled air liberated from compressed air motors at the working face is often very useful as a means of ventilation by the plenum method at the very point where air is most needed.

In regard to buildings and dwellings the greater care now taken in making doors and windows air-tight makes it more necessary than it formerly was to provide proper means of removing vitiated air and supplying fresh. In the old House of Commons Sir Christopher Wren made the chamber communicate by means of tubes with an upper room into which the heated air went while the cold air from that room flowed down; this produced draughts. In 1723 Dr. Desaguliers lit fires in the upper room; these fires heated the ventilating tubes from the chamber below, and caused air to ascend in them. He afterward used a centrifugal blowing wheel, turned by a man, to effect the same purpose. Before 1744 Dr. Stephen

Ventilation

Hales proposed to use bellows for driving air into a room or a ship, or for expelling it; these being sometimes worked by a roof windmill. In 1749 Mr. Samuel Sutton proposed the simple use of an open fire, the air supply of which is wholly drawn from the interior of a building or the hold of a ship. Count Rumford proposed to take the air supply of a building down from the roof by means of an air shaft; a plan which implied that the fire must be kept burning, and extraneous air excluded. In 1811, at the House of Lords, Sir Humphry Davy admitted air, heated if necessary, by numerous apertures in the floor, and used Dr. Desaguliers' mode of extraction, but his exit pipes were too small, and the plan failed. About 1818 the Marquis de Chabannes wrote on the ventilation of rooms. He proposed the admission of air by tubes heated by the fire, open to the outer air at one end and to the room at the other; and he proposed a chimney ventilator to remove the vitiated air, and also ventilating lamps and ventilating gas fittings to carry off not only the products of their own combustion, but also an additional quantity of air, through special channels. In the House of Commons he applied steam heat near the ceiling to warm the air and produce ascending currents. In 1834 Dr. Reid of Edinburgh introduced, at the temporary House of Commons built after the fire, the principle of a much larger exit area than had previously been thought necessary. The vitiated air was drawn through a furnace and up a high chimney. There were very numerous aperatures of admission for the air, which was filtered from dust, and warmed or cooled, dried or moistened, as might be required. The temperature was regulated by mixing highly heated air with an adjustable quantity of cold air in a mixing and equalizing chamber before allowing the mixture to enter the House. Mr. Gurney, in the new buildings, made the windows capable of being opened, introduced steam heating, and took in the air at a low level instead of from the top of a tower as Dr. Reid had done at first.

The products of combustion and respiration, comprising carbonic acid, water vapor, and a small quantity of anthropotoxin (which is a virulent poison when concentrated), are rapidly diffused throughout the air of a room; and more air ought to enter a room, in order to dilute these, than is actually necessary in order to supply the requisite oxygen. The quantity of air required per head per minute has been variously stated; the figure now usually stated is between 20 and 30 cubic feet per head per minute. The inflowing air should never be allowed to make sharp draughts across a room; for this reason it is frequently much safer to open a window widely than it is to open it a little; but the inflowing stream

may be broken up so as to diminish its velocity as far as is consistent with adequate flow. For this purpose perforated zinc, perforated glass, wire gauze, sliding valves, air bricks, and similar devices may be used; or the velocity may be practically diminished by directing the incoming stream of air toward the ceiling as by louvre ventilators in the window, or by Tobin's tubes. In these, when there is any withdrawal of air from the room, its place is taken by air directed in an upward stream through tubes whose upper end is open at a height of about six feet within the room, while the other end is open to the external air supply at a lower level. In Sir Douglas Galton's grate there is an air chamber behind the fire, which is continued into an air flue above. The air chamber is connected with the outer air; air is heated in the chamber and flue, and leaves the flue, passing into supply is thus kept up; warm air enters the chamber from outside, and a continuous the room, and cold draughts are prevented. In Pierce's stove air from outside flows round the fire within an open stove; it enters the room through a perforated grating at the top, ascends to the ceiling and circulates there. There is still a good deal of divergence of opinion as to whether air should be admitted at the top or the bottom of an apartment. Neither method is entirely free from objection. Cold air admitted at a low level never allows the lower part of the room to become warm; this might, however, be an advantage in sultry weather. Cold air admitted at a high level brings the products of combustion down to be breathed over again. Mr. Dye argues in favor of bringing in fresh air, if cold, at an intermediate height, just above people's heads.

For extraction of the vitiated air the open fireplace is to some extent effective even in summer time, for the chimney long remains slightly warm; but the current of vitiated air is better directed, not past the persons in the room, but toward the ceiling, and taken off by a grating opening into the chimney. When this is done down draughts must be checked by a valve, the fireplace must not be too wide or open, and the chimney itself must not be too narrow. The fault of an open fireplace is in general that when the fire is lit it extracts more air than is necessary to extract for ventilation purposes, and the air supply must come in partly through the house or down some other chimney, or may fail to find its way in at all, in which case the chimney smokes. During recent years a great deal of attention has been paid to utilizing the motive power of gas flames as a means of ventilation. In the Paris Gas Company's cooking demonstration rooms in the Rue du Quatre-Septembre, 28, ventilation by this means is said to have been most successfully carried out. In every case a sufficiently large exit channel ought to be provided, and this is a point apt to be overlooked.

**Ventnor,** the principal town on the S. shore of the Isle of Wight; 11 miles S. by W. of Ryde. Situated amid the finest of the fine scenery of the Undercliff, it has a S. exposure, well sheltered from the N., and so possesses a mild climate, suitable for various classes of invalids. The beach is composed of beautiful yellow shingle; and fossils are found in great quantity in the vicinity.

**Ventral Fins,** in ichthyology, paired or horizontal fins, inserted on the abdominal surface, behind, below, or in advance of the pectoral fins, whence they are called abdominal, thoracic, or jugular ventral fins respectively. They correspond to the hind limbs of the higher vertebrates. They are generally narrow, composed of a small number of rays, the outer of which is ordinarily bony. In some genera of the *Gobiidæ,* the ventral fins are united and form a suctorial disk.

**Ventricle,** in anatomy, the name given to various cavities smaller than that of the stomach. Thus the cerebrum has several ventricles, and the cerebellum one. Among these are the right and left lateral ventricles. The third ventricle is a narrow longitudinal cleft placed between the optic thalami of the cerebrum. The fourth, called also the ventricle of the cerebellum, occupies the space between the medulla oblongata in front and the cerebrum behind. The fifth, called also the ventricle of the septum, or sylvian ventricle, is situated between two laminæ of the septum lucidum, a thin transparent partition placed between the two lateral ventricles.

**Ventricles of the Heart,** two of the four cavities into which the heart is divided. They are called the right and the left ventricles. The right or anterior ventricle occupies most of the anterior surface of the right border and a smaller part of the posterior surface. The upper and left angle, called the arterial cone or infundibulum, is prolonged in a conical form to the commencement of the pulmonary artery. The muscular wall of the right ventricle is thickest at the base, and becomes thinner toward the apex. At its base are two orifices: The auriculo-ventricular orifice, protected by the tricuspid valve, and that of the pulmonary artery, protected by the semi-lunar or sigmoid valves. The left or posterior ventricle occupies the left border of the heart, about a third of its extent appearing on the anterior surface, the rest being visible behind. It is longer and narrower than the right ventricle, and oval in cross section. Its walls, except near the

apex, are three times as thick as those of the right ventricle. Its two orifices are very close together. One is the left auricular, the other the aortic opening, the former protected by the bicuspid or mitral, the latter by another semilunar or sigmoid valve, while the two are separated only by the attachment of the anterior segment of the mitral valve. The ventricles receive the blood from the auricles, and transmit it to the lungs and the body generally.

**Ventriculitidæ,** in zoölogy, sponges, simple or compound; cup, funnel or top shaped, cylindrical or ramose. Wall in meandrous folds, spicular nodes octohedral; radial canals blind. The outer or under surface of the sponge with elongate apertures or vents, the inner or upper surface either similar to the lower or with circular vents. Dermal layer a cribriform siliceous membrane. Root appendage of fasciculate siliceous fibers, united by transverse extensions, and without axial canals. They reach their maximum in the Cretaceous rocks. Only one genus now survives.

**Ventriloquism,** the art of speaking in such a way as to cause a hearer to believe that the sound comes, not from the person speaking, but from a different source. The name originated from the erroneous supposition that the sounds uttered were formed in the belly, whereas practice alone is necessary to carry this act of illusion to a high degree of perfection. The sounds are formed by the ordinary vocal organs—the larynx, the palate, the tongue, the lips, etc. The art of the ventriloquist consists merely in this: After drawing a long breath he breathes it out slowly and gradually, dexterously modifying and diminishing the sound of the voice; besides this he moves his lips as little as possible, and by various contrivances diverts the attention of his auditors. This art was known to the ancient Greeks.

**Ventura,** city, county-seat of Ventura co., Cal., about 55 miles N. W. of Los Angeles, on the Pacific Ocean, site of the old Mission of San Buena Ventura. It is prettily situated in a fertile and beautiful agricultural and fruit growing region, which, with its mild and agreeable climate, makes it a pleasant health resort. The land connections are by the Southern Pacific R. R., and by electric railways in divers inland directions. Its trade is chiefly in vegetables, fruits, grain, and petroleum. It has a public library, a good Y. M. C. A. building, public schools (graded and high), is in the vicinity of several hot springs, and within easy reach of the beautiful Ojai (pron. *Ohigh*) Valley, renowned for its wealth of wild flowers. Pop. (1900), 2,470.

**Venue,** in law the place where an action is laid. In the United States, the county in which the trial of a particular cause takes place is said to be the venue of that trial. In local actions, as for damages for an actual trespass, or for waste, etc., affecting land, the plaintiff must lay his declaration, or declare his injury to have happened in the very county and place where it really did happen; but in transitory actions, for injuries that might have happened anywhere, as debt, detinue, slander, and the like, the plaintiff may declare in what county he pleases, and then the trial must be had in that county in which the declaration is laid. To lay a venue is to allege or fix a place of trial. To pray a change of venue is to petition that a cause may be tried before another judge or in another place than the one first selected.

**Venus,** in Roman mythology, the goddess of beauty and love, and more especially of sensual love, her principal seats being the island of Cyprus and Cythera. This goddess is generally supposed to have been of Eastern origin and to have been the same as the Phœnician Astarte. Before her identification with the Greek Aphrodite, the daughter of Zeus and Dione, who, according to some accounts, arose from the foam of the sea, Venus was one of the least important divinities. The Romans regarded her as the progenitress of their nation, which was fabled to have sprung from Æneas, the offspring of her union with the Trojan Anchises. She was married to Vulcan, but was not remarkable for fidelity to her husband, and her amour with Adonis has been celebrated by classic poets and by Shakespeare. The rose, myrtle, and apple were sacred to her; among the birds, the dove, swan, and sparrow were her favorites. She is generally represented with her son Cupid in a chariot drawn by doves, or, at other times, by swans or sparrows. Among the most famous statues of Venus are the Venus of Cnidus, by Praxiteles (of which the Venus de' Medici, found at Tivoli, is supposed to be a copy), the Venus of Capua, and the Venus of Milo or Melos, found in the island of Melos. In the best days of art she was always represented as draped, in later times nude.

**Venus,** in astronomy, the second of the known inferior planets, if the arrangement be made according to their relative distances from the sun. With the exception of the moon, Venus is nearest of all the heavenly bodies to the earth, and, when near its extreme E. or W. elongation, is much brighter than even the largest of the fixed stars. It stands first in this respect also of all the planets, the nearest approach to it being that made at certain times by Jupiter. When Venus is at its maximum of brightness, it can sometimes be seen by the naked eye in sunlight within an hour of noon. Its comparative nearness to the sun causes it to be for six months a morning and for the other six months an evening star. In the first state, it is the Lucifer of the

Latins and the Phosphor of the Greeks; in the latter, it is the Hesperus of classical antiquity and of modern poetry. It undergoes phases like the moon. Father Castelli, a famous Florentine philosopher, reasoned this out, and, questioning Galileo on the subject, induced him to look with his telescope and see. On Dec. 30, 1610, he was able to announce to Castelli that the phases had been actually discerned. They are not visible to the naked eye, to which the planet is simply a brilliant speck, too small to reveal its actual form, which is much more globular than that of the earth. Its diameter is about 7,826 miles, or about 93 miles less than that of the earth. Were man placed on the surface of Venus, the earth would look a trifle larger and brighter than Venus does to us in our sky. The mass of Venus is about three-quarters that of the earth, or $\frac{1}{425,000}$ that of the sun; its density is about 0.850 that of the earth; its sp. gr. 4.81, as against 5.66, that of the earth. While a stone falling toward the earth passes through a little more than 16 feet in the first second, it would, if falling to the surface of Venus, pass through about 13 feet only in the same time. The excessive brightness of Venus makes the time of its rotation somewhat doubtful; it is provisionally placed at 23 hours 21′. Its mean distance from the sun is 67,000,000, its greatest distance 67,500,000, and its least 66,600,000 miles. These numbers show that its orbit departs but slightly from a circle. Its periodic time is 224.7 mean solar days. Observation on the passage of the planet over the sun's disk is the best method of ascertaining the distance of the great luminary; it has also revealed the fact that Venus has an atmosphere, but its composition is as yet uncertain. Old observers thought they detected a satellite; modern astronomers have not confirmed this view, and believe it to have been founded on optical delusion.

**Venus's Flytrap.** See DIONŒA.

**Venus's Looking-glass,** the *Specularia speculum*, a very pretty little annual, of the natural order *Campanulaceæ* which has long been a favorite in flower gardens, and is a native of cornfields in the S. of Europe. It has brilliant blue, white, or violet-colored flowers, which fold up in a pentagonal manner, toward evening. There are seven or eight other species, one a native of Great Britain (*S. hybrida*), all being pretty, neat herbs.

**Vera Cruz,** a State of Mexico; bounded on the E. by the Gulf of Mexico and on the N., W., and S. by the States of Tabasco, Chiapas, Oajaca, Puebla, Hidalgo, San Luis Potosi, and Tamaulipas. It extends in a strip about 50 miles wide along the coast, and has an area of 29,201 square miles. The coast strip with the exception of the N. part is in places narrow, flat, low and rolling, with occasional swamps, lagoons, and hills. On the Puebla boundary line rises Mount Orizaba, the highest peak in Mexico, and some believe the highest peak in North America. In the lowlands of the S. E. portion there are occasional spurs, including the volcano of Tuxtla, which is nearly 5,000 feet high. Many short rivers flow down from the mountains, of which the navigable Panuco in the N. is the most important. The climate on the coast is warm and in summer unhealthy. The more elevated parts are temperate and healthy. Agriculture is the chief industry of Vera Cruz, the products including tobacco, coffee, cotton, sugar, vanilla, etc. Pop. (1900) 981,030.

**Vera Cruz,** the principal port of Mexico; on the E. coast, in a low, unhealthy plain, backed by drifting sandhills; 263 miles E. of the City of Mexico. There is no harbor, but only an open roadstead between the city and the island castle of San Juan de Ulua, which, with two shore batteries, defends the port. The streets are wide and straight, with numerous squares, and low, picturesque houses of various colors. The chief buildings are the cathedral, custom house, and casino; a number of the churches have been perverted into tobacco factories. The moist, hot climate of Vera Cruz is notoriously unhealthy, and the annual death rate ranges from 1 in 11 to 1 in 20 of the population, mostly from lung diseases, and from yellow and other fevers. The fierce "northers," if they often drive vessels ashore from the exposed anchorage, at least are of use in sweeping away the fevers for a time. Most of the commerce is in the hands of foreigners; nearly 600 vessels enter and clear annually. The full title of the city is Villa Nueva de la Vera Cruz, or New City of the True Cross. The old town was founded by Cortez in 1520 on the spot where he had landed the year before; the new one dates from 1580. The royal forces held out in the castle till November, 1825. The castle capitulated to the French in 1838, and to General Scott in 1847; and during the French occupation the town was the base of supplies from 1862 to 1867. Pop. 29,164.

**Veragua,** a region in the W. part of the Isthmus of Panama; in the department of Panama. It was named by Columbus, who discovered it in 1502, but was unable to effect a settlement there on account of the Indians. Similar attempts were made by Diego de Nicuesa in 1509, and by Maria de Toledo, acting for her son, Luis Columbus, in 1535; but neither of these was successful. It was partly settled during the colonial period, and for a time was a province of New Granada.

**Veragua, Duke of,** a title conferred on the lineal descendents of Christopher Columbus. It was first borne by Luis Columbus

in 1536. From him it passed to Diego Columbus, the great-grandson of the famous discoverer. He died childless in 1578, and the male line of Columbus came to an end. A lawsuit for the succession to the title followed, and after 30 years was settled in favor of the descendants of Isabel, sister of Louis Columbus. This line coming to an end in 1733, the title was, after more litigation, settled on the descendants of Francesca, sister of the Diego Columbus who died in 1578. The 13th Duke of Veragua in direct descent from Christopher Columbus, was born in Madrid, Spain, in 1837. In 1893, with his wife, he visited the United States on the invitation of the government, and witnessed the opening ceremonies of the Columbian Exposition. He was everywhere received with high honors. He died in Madrid, Oct. 30, 1910.

**Veratric Acid,** $C_9H_{10}O_4 = C_6H_3(OCH_3)_2 CO{\cdot}OH$; a monobasic acid discovered by Merck, in 1839, in sabadilla seeds. It is prepared by exhausting the bruised seeds with alcohol containing sulphuric acid, neutralized with milk of lime, filtering and evaporating the filtrate to dryness. It crystallizes in colorless four-sided prisms, slightly soluble in water, soluble in alcohol, but insoluble in ether. Heated to 100° it gives off water and becomes opaque; at a higher temperature it melts, and sublimes without decomposition.

**Veratrin,** or **Veratria,** formula, ($C_{37}H_{53}NO_{11}$), a vegetable alkaloid found in *Veratrum sabadilla, Veratrum album,* etc. It is generally obtained as a crystalline powder, nearly white, very acrid and poisonous, insoluble in water, but very soluble in alcohol. In the form of tincture, and still more in that of ointment, veratrin is much used as an external application in cases of neuralgia and obstinate rheumatic pains. The smallest quantity entering the nose causes violent and even dangerous sneezing.

**Veratrum,** in botany, the typical genus of *Veratreæ.* Perianth of six equal divisions, sessile, persistent; stamens six, springing from the perianth; styles three, persistent; stigmas three, spreading; capsules three; seeds numerous. Plants with perennial roots, erect stems, ovate pointed leaves, and panicles of polygamous flowers. Natives of Europe and North America. *V. album* is the white hellebore. The stem is two to four or five feet high, the peduncles downy, the flowers in a thrice-compound panicle. It grows in the Alps of Switzerland and Savoy and in the Pyrenees. It is a powerful emetic and drastic purgative, formerly given in mania, epilepsy, etc.; externally it is used in itch. Another European species is *V. nigrum,* the dark-flowered veratrum. *V. viride* is the green or American hellebore, found on the E. coast of North America, from Canada to Carolina. It is called also the pokeroot and the swamp hellebore. The rhizome is a powerful cardiac, arterial, and nervous sedative, lowering the pulse, the respiration, and the heat of the body. It is used in pneumonia, rheumatism, gout, neuralgia, asthma, and in some cardiac affections. *V. sabadilla,* a Mexican and West Indian species, was formerly believed to yield cevadilla.

**Veratrum Resin,** $C_{14}H_{36}N_2O_3$ (?); veratrin; a brownish resin, extracted from sabadilla seeds. It is insoluble in water, ether, and alkalies, soluble in alcohol, melts at 185°, and decomposes at a higher temperature.

**Verazzano.** See VERRAZANO.

**Verb,** in grammar, that part of speech which predicates something in regard to something else (the subject or thing spoken of); as, The man *lives,* The boy *threw* a stone. Verbs affirm action or existence of a subject under certain conditions or relations called voice, mood, and tense. Verbs may be classified into: (1) Transitive, requiring an object, as, He *learns* his lesson; and (2) Intransitive, as, He *runs.* Transitive verbs include reflexive verbs. Some transitive verbs are reflex in meaning though not in form, and appear, at first sight, as if used intransitively; as, He *keeps* out of danger, *i. e.,* He *keeps himself,* etc. Sometimes a transitive verb has a passive sense with an active form; as, The cakes *ate* short and crisp. Some verbs are sometimes transitive and sometimes intransitive; as, He *floats* a scheme, The body *floats.* Only transitive verbs have a passive voice. Some intransitive verbs, by means of a preposition, become intransitive, and may be used passively; as, He *laughed at* the act, The act *was laughed at by* him. Intransitive verbs include a large number that might be classed as frequentative, diminutive, inceptive, desiderative, etc. Some intransitive verbs have a causative meaning, and take an object: I *run,* I *ran* a pin into my finger. Intransitive verbs may take a noun of kindred meaning as object (called the cognate object); as, to *sleep* a sleep, to *run* a race, to *live* a life. Verbs used with the third person only are called impersonal verbs; as, me*thinks,* it *rains,* it *snows.* In the case of some verbs, the transitive form is distinguished from the corresponding intransitive by a change of vowel; as, *raise, rise; set, sit; fell, fall.* Such verbs are called causative. The past tense of strong verbs is expressed by a change of vowel only; as, *throw, threw;* the past tense of weak verbs by adding to the verbal root the syllable *-ed;* as, *shout, shouted;* or its euphonic substitute *d* (*-ed*); as *love, loved.* Auxiliary verbs are used in forming the tenses of other verbs; as, I *have* seen.

**Verbascum,** mullein, the typical genus of *Verbasceæ;* tall, erect, tomentose or wool-

ly plants, usually biennial. Leaves alternate; inflorescence in racemes; calyx five-partite; corolla rotate or regular; stamens five, the three upper ones or all five hairy; capsule of two cells and two valves, septicidal; seeds many; known species about 80, chiefly from Europe and Asia. The flowers of the great mullein, when dried in the sun, give out a fatty matter, used in Alsace as a cataplasm in hemorrhoids. Its root is administered in India as a febrifuge. The seeds of *V. thapsus* and *V. nigrum* are used by poachers to poison fish, and the flowers of *V. lychnitis* to destroy mice.

**Verbeck, Guido Fridolin,** a Dutch-American missionary; born in Zeist, Holland, Feb. 1, 1830; was graduated at the Auburn Theological Seminary, Auburn, N. Y., in 1859, and in the same year was sent to Japan by the Reformed Church of America. The Japanese government engaged him in 1863 to carry on educational work. He was superintendent of instruction and teachers in the foreign department at the Imperial University, Tokyo, in 1869–1873; was engaged in missionary work in 1873–1879, and was then again employed by the government as a translator and organizer. In 1891 he was made instructor of theology in the Meiji Gakuin. He was the author of "History of Protestant Missions in Japan" (1883) and the translator of "The Code Napoleon"; "Two Thousand Legal Maxims"; etc. He died in Tokyo, Japan, March 9, 1898.

**Verbena,** a genus of plants of the natural order *Verbenaceæ*. The genus consists of numerous species of herbs or shrubs which inhabit the tropical and subtropical parts of the world; most numerous in America, more rare in Asia and Africa. They have opposite leaves, sessile bracteated flowers in simple or panicled spikes, terminal or axillary; a tubular five-toothed calyx, tubular corolla more or less curved with a spreading limb, generally unequally lobed; four stamens, included in the tube, the upper pair sometimes without anthers; a slender style with capitate stigmas. The ripe fruit splits into two or four nutlets, each containing one seed. The genus is more remarkable for the beauty of a number of the species, which under cultivation have given origin to numerous varieties greatly prized for their brilliant colored flowers, than for other virtues, though formerly the English species was credited with potent medicinal qualities, particularly in ailments of the bladder and in the cure of defective vision, which, however, appear to have been purely imaginary. It was also worn on the person as a protection against blasts and to promote general good fortune, for which purpose it was gathered with special observances and ceremony. The lemon-scented verbena is *Aloysia citriodora*, which belongs to the same natural order; but the perfumers' oil of verbena is derived from the lemon grass.

VERBENA: GARDEN VARIETIES.

**Verbenaceæ,** in botany, verbenes; an order of perigynous exogens, alliance Echiales; trees, shrubs, or herbs. Leaves generally opposite, simple or compound, without stipules. Flowers in opposite corymbs, or spiked alternately, or in dense heads, or rarely axillary and solitary. Calyx tubular, persistent, inferior. Corolla hypogynous monopetalous, tubular, deciduous, the limb generally irregular. Stamens generally four, didymous, or of equal length, rarely two. Style one; stigma bifid or undivided; ovary two or four celled; fruit nucamentaceous or berried, composed of two or four nucules in a state of adhesion. Closely akin to Labiatæ, but the ovary is not four-lobed, nor is there the aromatic smell. The species are found chiefly in the tropics, and in South America beyond them. In hot countries they are generally shrubs or trees, in temperate climates they are mostly herbs. Known genera 45, species 663.

**Verbesina,** the typical genus of *Verbesineæ;* herbs, shrubs, or small trees growing in America with pinnately-lobed leaves, and flowers generally yellow, or the ray florets white, those of the disk yellow; the achenes with two stiff awns at the apex.

**Verd Antique,** in petrology, a name given to a variety of marble (carbonate of lime) of a clouded green color, owing to the presence of serpentine, which sometimes occurs in angular patches. Also applied to serpentine rocks of shades of green which are veined with greenish calcite or dolomite. Sometimes applied, though erroneously, to the green porphyry used by the Romans.

**Verdi, Giuseppe,** an Italian composer; born in Roncole near Busseto, Italy, Oct. 9, 1813. At 10 years he was organist of the small church in his native village; at 16 he was provided with funds to prosecute his studies at the conservatorium at Milan; but at the entrance examination he showed so little evidence of musical talent that the authorities declined to enroll him. Nothing daunted, he pursued his studies under Lavigna from 1831 to 1833, when, according to agreement, he returned to Busseto to take the place of his old teacher Provesi, then deceased. After five unhappy years in a town

where he was little appreciated, Verdi returned to Milan. His first opera, "Oberto, Conte di S. Bonifacio," is chiefly indebted to Bellini, and the next, "Un Giorno di Regno" (which fulfilled its own title, as it was only once performed), has been styled "un Bazar de Reminiscences." "Nabucodonosor" (1842) was his first hit, and in the next year "I Lombardi" was even more successful — partly owing to the revolutionary feeling which in no small degree was to help him to his future high position. Indeed his name was a useful acrostic to the revolutionary party, who shouted "Viva Verdi," when they meant "Viva *V*ittorio *E*manuele *R*e *D'I*talia." "Ernani," produced at Venice in 1844, also scored a success, owing to the republican sentiment in the libretto, which was adapted from Victor Hugo's "Hernani." Many works followed in quick succession, each rousing the enthusiasm of the audiences chiefly when an opportunity was afforded them of expressing their feelings against the Austrian rule. Only with his 16th opera did Verdi win the supremacy when there were no longer any living competitors; and "Rigoletto" (1851); "Il Trovatore," and "La Traviata" (1853) must be called the best, as they are the last of the Italian opera school. "I Vespri Siciliani" (1855) and "Simon Boccanegra" (1857) were not so successful as "Un Ballo in Maschera" (1859); and none of them any more than "La Forza del Destino" (1862) or "Don Carlos" (1867) added anything to the fame of the composer of "Il Trovatore." Only now begins the interest which the student of musical history finds in Verdi's life. Hitherto he had proved a good man struggling with adversity and poverty, a successful composer ambitious to succeed to the vacant throne of Italian opera. But the keen insight into dramatic necessity which had gradually developed and had given such force to otherwise unimportant scenes in earlier operas also showed him the insufficiency of the means hitherto at the disposal of Italian composers, and from time to time he had tried to learn the lessons taught in the French Grand Opera school, but with poor success. Now a longer interval seemed to promise a more careful, a more ambitious work, and when "Aïda" was produced at Cairo (1871) it was at once acknowledged that a revolution had taken place in Verdi's mind and method, which might produce still greater results. The influence of Wagner and the music drama is distinctly to be felt, and the advantage of more deliberate work. But Verdi was apparently not yet satisfied. For 16 years the successful composer maintained absolute silence in opera, when whispers of a great music drama roused the expectation of musical Europe to an extraordinary pitch; nor were the highest expectations disappointed when "Othello" was produced at Milan in 1887. The surrender of Italian opera was complete, and Verdi took his right place at the head of the vigorous new school which has arisen in Italy and which promises to regain for the "Land of Song" some of her ancient preëminence in music. A comic opera, "Falstaff," was produced in 1893 by the composer; a Requiem Mass (1874) is his only important non-operatic work. He died in Milan, Italy, Jan. 27, 1901.

**Verdigris,** or **Verdegris,** in chemistry, a green pigment prepared in the S. of France, by exposing thin plates of copper for some time to the action of the refuse of the grape from which wine has been made. In the United States it is sometimes prepared by placing copper plates in contact with woolen cloths, which have been soaked in pyroligneous acid. It is soluble in dilute sulphuric acid, and is very poisonous. In pharmacy, verdigris is occasionally used externally, in powder or mixed with honey and vinegar, as an escharotic.

**Verditer,** a hydrated oxide of copper formed by adding lime to a solution of a salt of this metal, such as the nitrate, when a blue precipitate is thrown down. This blue verditer is scarcely injured by light, but it is blackened by impure air. It is used in common distemper painting and in paper staining. Green verditer is the blue pigment changed to green by boiling, but it is a coloring substance of little value.

**Verdun,** a fortified French town in the department of Meuse; 35 miles W. of Metz. It has 11 forts, a cathedral, and manufactures of iron, liquors, sweetmeats, leather, and beer. In 843 a famous treaty was made here between the Emperor Lothaire and his brother Ludwig the German, by which the Frankish empire was divided in three. The fortress has been often besieged; as it was in 1870 by the Germans for six weeks, when it capitulated. It was the last place held by Germany, given up only in September, 1873. Pop. (1901) 21,360.

**Verdy du Vernois, Julius von,** a Prussian soldier; born in Freistadt, Silesia, July 19, 1832. He was made general of infantry in 1888, and in 1889 Prussian minister of war. He wrote: "The Second Army in the Campaign of 1866"; "Studies in the History of War" (1876); "Contribution to the Game of War" (1876); "Studies on War" (1891–1892); "Personal Reminiscences of the War of 1870–1871" (1895). His tragedy "Alaric" was played at Strassburg in 1894.

**Vere, Aubrey Thomas de.** See De Vere, Aubrey Thomas.

**Vere, Sir Francis,** an English soldier; born in Crepping or Crustwick, England, about 1560. He obtained a company in the Bergenop-Zoom garrison in the autumn of 1586, and won his first laurels in the mem-

orable siege of Sluys, being knighted by Lord Willoughby at its close. He succeeded him in August, 1589, in the chief command in the Netherlands, with the rank of sergeant-major general. His spirit and courage even when desperately wounded made him a soldier's hero, while his skill and energy as a captain at Breda, Deventer, and a hundred fights carried his fame far beyond the Netherlands. He shared the glory of the Cadiz expedition (1596) as lieutenant-general and lord-marshal, and also next year the failure of the Island Voyage, the only laurels which fell to his bitter rival Raleigh. Again in Holland, he governed Brill and helped Maurice to victory at Turnhout (1597) and Nieuwpoort (1600), as well as in the heroic defence of Ostend. He died in London, England, Aug. 28, 1609, and was buried in Westminster.

**Vere, Horace, Lord,** an English military officer; born in 1565; brother of the preceding; at 20 went with Francis to the Netherlands, and took a hero's share in all his battles. Knighted for his courage at Cadiz, he succeeded his brother as governor of Brill, and at the beginning of the Thirty Years' War was sent by James I. to defend the Palatinate. But he was shut in at Mannheim and forced to surrender to Tilly (1623). He was created Baron Vere of Tilbury in 1625, and died suddenly at Whitehall, May 2, 1635.

**Verena, Sophie,** pseudonym of SOPHIE ALBERTI, a German author; born in Potsdam, Germany, Aug. 5, 1826. She wrote the popular novel "A Son of the South" (1859), and a collection of tales entitled "Old and New" (1879). She died in Potsdam, Aug. 15, 1892.

**Vereshtchagin, Wasiliy,** a Russian historical painter; born in Tcherepovets, Russia, Oct. 26, 1842; was educated at the naval school in St. Petersburg. In 1864 he entered the Art School at Paris, where Gerôme was his master. He joined the Caucasian expedition under General Kaufmann in 1867, and in 1869 went to Siberia. In 1874 he went to India with the Prince of Wales, and afterward settled in Paris. He took part in the Russo-Turkish War; was wounded at Plevna; and was drowned in the Russian battleship "Petropavlovsk," sunk by the Japanese at Port Arthur, April 13, 1904. His pictures are of immense size, extremely realistic, and treat chiefly of the horrors of war.

**Veretillidæ,** in zoölogy, a family of *Sclerobasic Zoantharia*, having an elongate axis, with retractile zoöids over its entire surface, and its lower part bulbous, naked, or soft. It is divided longitudinally by two intersecting membranes, with a calcareous axis in the lower part of the stem, or it may be simple and fleshy.

**Verga, Giovanni,** an Italian author; born in Catania, Sicily, in 1840. His works include: "Story of a Cricket" (1872); "Eva" (1873); "Stories" (1874); "Nedda" (1874); "Eros" (1875); "Royal Tiger" (1876); "Helen's Husband" (1877); "Life in the Fields" (1880); "I Malavoglyia" (1881), translated as "The Mouse under the Medlar Tree"; "Rustic Tales" (1883); "Rustic Chivalry" (1884), from which the libretto of Mascagni's famous opera "Cavalleria Rusticana" was derived; "The How, the When, and the Wherefore"; etc.

**Vergennes, Charles Gravier,** a French statesman; born in Dijon, France, Dec. 28, 1717. After a diplomatic career in Germany, Turkey, and Sweden, he became Louis XIV.'s minister of foreign affairs, and, by promoting the independence of the United States, concluded the alliance of 1778. He died in Versailles, Feb. 13, 1787.

**Vergil, Polydore,** an Italian author; born in Urbino, Italy, about 1470. He had his education at Bologna, and seems to have commenced life under the patronage of Guido Ubaldo, Duke of Urbino, to whom was dedicated his first work, "Proverbiorum Libellus" (1498), an earlier book than the "Adagia" of his friend Erasmus. His second, "De Inventoribus Rerum" (1499), which was also the earliest book of its kind, became extremely popular, and was translated into English, Spanish, and Italian. Already chamberlain to Pope Alexander VI., Polydore was sent to England in 1501 as deputy-collector of the tribute called Peter's pence, his superior in the office being his kinsman, Adrian de Castello, now Cardinal Sti. Chrysogoni, and soon after Bishop of Hereford. Polydore was presented to the living of Church Langton in Leicestershire in 1503, and next year was enthroned as the Bishop of Hereford's proxy on his translation to the see of Bath and Wells. In 1507 he was collated to the prebend of Scamblesby in Lincoln, in 1508 was nominated archdeacon of Wells, was naturalized in 1510, and collated to the prebend of Oxgate in St. Paul's in 1513. Early in 1514 he was flung into prison for sending abroad slanderous letters about Wolsey, but apparently was soon released, whether from the entreaties of Leo X. and the Cardinal de Medicis or his own abject appeals to Wolsey. In 1525 he published the first genuine edition of Gildas, the year after the treatise "De Prodigiis," dialogues in attack on divination. His "Historiæ Anglicæ Libri XXVI." appeared at Basel in 1534; the 27th book, bringing the story down to 1538, was added in the third edition (1555). About 1550 he obtained a license from Edward VI. to return to Italy for his health's sake, without losing his livings, and next he traveled to Urbino, where he lived in quiet till his death

in 1555. His history is a work of great research, vigorous and independent, written in clear and elegant Latin. It is the fullest original narrative for the reign of Henry VII., and here Hall has simply translated his Latin into English. As regards Wolsey, the value of his evidence is discounted by his strong prejudice. He spared no pains to ensure accuracy, and a strongly rational bias of mind hindered him from accepting the Scottish fables supplied him by Gavin Douglas, or the exploits of Brut and Arthur warranted by Geoffrey of Monmouth.

**Vergil** (PUBLIUS VERGILIUS MARO), the first of Latin poets; born in Andes near Mantua, Oct. 15, 70 B. C. The plain of Lombardy then lay outside of the limits of Italy, and formed a province known as Cisalpine Gaul. The population was mainly Celtic, but was already permeated by the Latin language and civilization; and Julius Cæsar, when he admitted it to full Roman citizenship in Vergil's 21st year, was adjusting rather than extending the natural limits of Italy. The name Vergilius is apparently Celtic, and in Vergil's Celtic blood modern critics have found the origin of his romantic and melancholy temper, and of the deep sense of natural beauty and the spiritual meaning of nature, in which he stands alone among Greek and Latin poets.

Vergil's father owned a small property in his native place, where, besides the ordinary work of a farm, he occupied himself in forestry and bee-keeping. He was well enough off to give his son the education which was generally confined to a wealthier class. The boy was sent to school at Cremona and Milan, and at the age of 16 went to Rome and studied rhetoric and philosophy under the best teachers of the time. His studies were probably interrupted by the civil war; at all events, we know nothing of the next years of his life till 41 B. C. The victorious triumvirs were then providing for the immense armies which had been disbanded after the battle of Philippi by settling them on confiscated lands throughout Italy. Vergil's farm was part of the confiscated territory of Cremona; but his reputation as a rising poet had already brought him under the notice of the governor of the district, Asinius Pollio, himself a distinguished man of letters. By Pollio's advice he went to Rome, with special recommendations to Octavianus; and though his own property was ultimately not restored to him, he obtained ample compensation from the government, and became for a few years one of the circle of endowed court poets who gathered round the prime minister Mæcenas.

In 37 B. C. the "Eclogues," a collection of 10 pastorals modelled in those of Theocritus, were published, and received with unexampled enthusiasm. Soon afterward Vergil withdrew from Rome to Campania. The munificence of Mæcenas had placed him in easy and even affluent circumstances. He had a villa at Naples, and a country house near Nola, within easy reach of it; and he seems to have lived almost entirely in this neighborhood during the seven years in which he was engaged on the composition of the "Georgics," or "Art of Husbandry." This poem, which is in four books, and deals with tillage and pasturage, the cultivation of trees, especially the vine and olive, and the breeding of horses, cattle, and bees, appeared in 30 B. C., and confirmed Vergil's position as the foremost poet of the age. The remaining 11 years of his life were devoted to a larger and in some respects more uncongenial task, undertaken at the urgent and repeated request of the emperor, the composition of a great national epic. During these years he lived a secluded life, chiefly in Campania and Sicily; he seems also to have traveled in Greece, and to have paid occasional visits to Rome, where he had a house in the fashionable quarter on the Esquiline. The subject he chose was the story of Æneas, the Trojan, the legendary founder of the Roman nation and of the Julian family, from the fall of Troy to his arrival in Italy, his wars and alliances with the native Italian races, and his final establishment in his new kingdom. By 19 B. C. the "Æneid" was practically completed, but Vergil had set apart three years more for its final revision. In the summer of that year he left Italy with the intention of traveling in Greece and Asia; but at Athens he fell ill, and returned only to die at Brundusium a few days after landing, on Sept. 21. He had almost completed his 51st year. In his last illness he expressed a wish to burn the "Æneid," and he left directions to that effect in his will. By the command of Augustus these directions were disobeyed, and it was published as we now possess it. At his own wish he was buried at Naples, on the road to Pozzuoli, his tomb for many hundred years after being worshiped as a sacred place.

In person Vergil was tall and dark, shy and silent in manner, and suffering from delicate health throughout his life. No authentic portrait of him exists. He never married, and from his will it would appear that a half-brother was the only near relation whom he left. His sincerity and sweetness of temper won the warm praise of Horace, who is not lavish of praise, and the fastidious purity of his life in an age of very lax morality gained him the same name of "the lady" by which Milton was known at Cambridge.

Besides the three works already mentioned, a few juvenile pieces of more or less probable authenticity are extant under his name. These are the "Culex" and the "Moretum," both in hexameter verse, the former an "epyllion," or short poem of narrative and description in the epic manner,

the latter an idyll freely translated from the Greek of Parthenius; the "Copa," a short elegiac piece; and 14 little poems in various meters, some serious, others trivial, which come under his name at the head of a collection of minor Latin poetry incorporated in the Latin anthology. These pieces are not printed in most editions of Vergil, nor are any of them certainly authentic, though some of them passed as his among scholars within a century after his death. The "Ciris," a piece of the same kind as the "Culex," is now agreed to be by a contemporary imitator.

The supremacy of Vergil in Latin poetry was immediate and almost unquestioned. The enthusiasm excited by the "Eclogues" rose partly from the recognition in them of a new sense of romantic beauty, partly from the feeling that a Roman artist had at last appeared who could be set beside the great artists of Greece. In the hands of Lucretius and Catullus the intractable Latin tongue had proved able to express impassioned argument and vivid emotion; in the "Eclogues" it assumed a richness, harmony, and sweetness till then quite unknown. The promise shown in the "Eclogues" was more than fulfilled in the "Georgics." In no work of ancient or modern art is there a more sustained splendor, an ampler music of language, a more magical fusion of thought and feeling. The workmanship of the "Æneid" is more unequal; but in its great passages there is the same beauty, with an even fuller strength and range. Vergil left the Latin language to his successors as an instrument of which he had sounded the full compass and developed the entire capacity; subsequent Latin poetry has to be estimated by the degree in which it falls short of his. There were some in ancient as in modern times who continued to prefer the direct force and austere simplicity of Lucretius to Vergil's rich and intricate harmonies; but for the world Vergil was the imperial poet, the great voice of Rome.

The reputation of Vergil from his own time till now is probably unparalleled in its continuity. His works were established classics even in his lifetime, and soon after his death had become, as they still remain, the school books of Western Europe. By the 3d century his poems ranked as sacred books, and were regularly used for purposes of divination. The purity and piety in which he is eminent beyond other Latin poets, together with the mystical interpretation of the fourth "Eclogue," which found in him an unconscious channel of divine inspiration and a "prophet of Christ among the Gentiles," made his fame almost as high in the Christian as in the pagan world; of all the testimonies borne to his matchless power in stirring the deepest human emotions the subtlest and most eloquent are



those of two princes of the Catholic Church nearly 15 centuries apart from one another — Augustine and Newman. In the dark ages his fabled powers as a magician almost eclipsed his real fame as a poet; but with the revival of learning he resumed his old place; for Dante and Petrarch, and for the whole of the earlier and later Renaissance, he was the first of the world's poets. In the earlier part of the 19th century his reputation for the first time suffered serious eclipse. The spiritual upheaval of the age which followed the French Revolution turned for inspiration to fresher sources; and in the general anarchy of taste which followed Vergil fell out of fashion among readers too capricious or too impatient to feel his charm. Criticism has now returned to a juster view, and the most recent estimates of Vergil, both in France and England, are also the most appreciative, not only of his immense learning and of the wonderful truth and refinement of his descriptions, but of his eminence in all the essential qualities of poetry. Of his consummate mastery of meter and diction there has never been any question; even those who have thought least of his dramatic power or imaginative insight have acknowledged the finished beauty of his language, and the stately and haunting music of his verse, to which the noblest tributes has been given by Lord Tennyson, himself the most Vergilian of modern poets.

**Vergil the Magician.** Not the least remarkable circumstance in the history of the poet Vergil is the reputation of the magician which the mediæval imagination persistently associated with his name. His undisputed supremacy and the peculiar fascination of his poetry made easy the notion of a wisdom and mystic meaning wrapped up in his verses, and as early as the 3d and 4th centuries we find Christian authors like Minucius Felix, Lactantius, and Augustine separating him from all other pagan writers. Messianic prophecy was read into his fourth "Eclogue," and Vergil and the Sibyl were actually introduced into the liturgy of the Church, along with the Messianic prophecies of the Old Testament, as witnesses to a coming Messiah. Had not St. Paul visited Vergil's tomb at Naples, and did not Statius owe his conversion to the fourth "Eclogue"? Centos were manufactured out of the "Æneid" giving the whole of sacred history in epitome. And already under the Roman empire it was customary enough to discover one's fortune by selecting lines at random from his epic — the famous "Sortes Vergilianæ." Ultimately in the "Divina Commedia" of Dante the 13th-century Vergil became a representative of enlightened reason, a gifted genius standing midway between paganism and Christianity. This deep half-religious veneration for Vergil, together with the scholastic conception of

his superior wisdom, especially in mathematics and medicine, helps us to understand Dante's conception of the *vates sacer;* in the contemporary "Dolopathos," a special version of the "Seven Wise Masters" we see the mythopœic process at work, the name of Vergil taking the place of the sage Sindibad.

It was out of Neapolitan folklore that the legendary reputation first grew, gaining many strange accretions from all sides on its course. But the earliest literary accounts were not Italian. The first writer to mention it is John of Salisbury in his "Polycraticon de Nugis Curialium et Vestigiis Philosophorum" (1156), who describes Vergil as making for Marcellus a fly that would destroy all other flies. But the first artistic treatment of the theme is seen in the letters of Conrad of Querfurt, afterward Bishop of Hildesheim, the representative of the Emperor Henry VI. at Naples. He tells us he had seen the palladium of Naples (a model of the city enclosed in a narrow-necked bottle) and many other talismans and charms wrought by Vergil's skill — the most useful, the statue of an archer pointing an arrow at Vesuvius, which prevented its eruptions. These stories occur again with additions in Alexander Neckam's "De Naturis Rerum," in the "Otia Imperialia" of Gervase of Tilbury, the French poem "Image du Monde" (1245), where the famous brazen head appears, as well as the first thread of love. In the rhymed "Weltbuch" of Johann Enenkel of Vienna (1250) we read how Vergil, finding the devil imprisoned in a glass bottle, released him after he had learned all his magic arts. His first task was the creation of a perfect woman. But not content with her he made love to a married woman of Rome who befooled him by a pretended assignation, and left him exposed to public ridicule hanging half up to her window in a basket. This last was an exceedingly popular mediæval story, and was even carved on the misereres of churches. In the "Roman de Cleomandes" of Adenés li Rois (1290) we find the first mention of Vergil's figure holding the mirror at Rome which showed if treason was hatching anywhere — the famous Salvacio Romæ — as well as the copper statue of an archer whose arrow pointed at the public fire kept it alive; his magic garden we first meet in Padre Giordano's contemporary "Life of San Guglielmo of Vercelli." The old stories again occur in the French romance of the "Renard Countrefait" (1319); his compacts with the devil, with much detail, in the 14th-century German poems "Reinfrit von Braunschweig" and the "Wartburg-Kreig." The earliest attempt in Italy to weave all the varying legends into a collected form is the prose "Cronica di Partenope" of Bartolommeo Caracciolo (1382). In the "Process of the Seven Sages" (1330), the English form of the "History" thereof, the ninth tale is devoted to the "nigramancie" of Vergil at Rome, and the same reappéars in the "Gesta Romanorum" (No. 27). The latest stages of the legend may be seen in "Le Myreur des Histors," written at Liége by Jean d'Outremeuse in the 14th century; the English "Lyfe of Vergilius" (1510; reprinted in W. J. Thoms's "Early English Prose Romances"); its French version, the "Faicts Merveilleux"; and in the Spanish "Romances of Virgilius" (1550). In the "Faicts" Vergil makes a statue the sight of which ensures the virtue of women. His own wife and other licentious Roman ladies try to break it, but in vain. He carries off the beautiful daughter of the Soldan of Babylon, baffles her father by sorcery, builds Naples, and establishes there a school of necromancy.

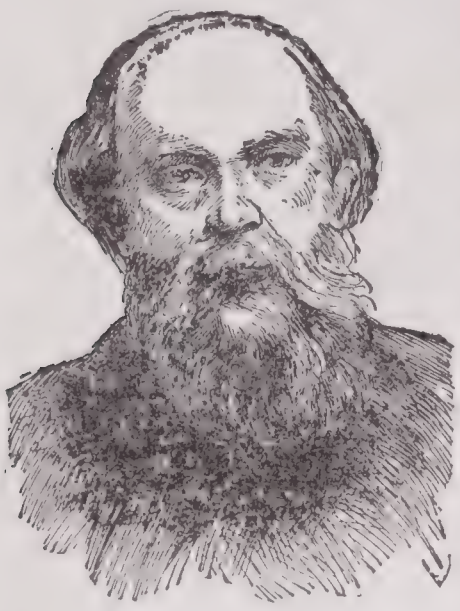
Professor Comparetti thinks these legends of popular and Neapolitan origin, but recognizes in them two elements, the first exclusively Neapolitan connected with the notion of a special intimate affection of Vergil for the city; the second consisting of the distinct and not merely Neapolitan belief in certain public talismans attributed to Vergil, analogous accretions of legend being associated with most monuments of antiquity. J. S. Tunison, in his "Master Virgil" (Cincinnati, 1888), labors to prove that the legend is originally of N. not S. origin, and of literary rather than popular genesis, the first writers who related tales of Vergilian magic being Norman Latinists of England and France.

**Vergniaud, Pierre Victurnien,** a French orator; born in Limoges, France, May 31, 1753. Turgot, then intendant of the Limousin, nominated him to a bursarship at the Collége du Plessis at Paris. He studied divinity aimlessly at the Sorbonne, but soon grew tired of it, next took a post in the civil service at Paris, but ere long threw it up and retired to his bankrupt father's house at Limoges. But a brother-in-law helped him to settle as an advocate at Bordeaux in 1781, and he quickly gained a great practice, and was elected a deputy to the National Assembly in 1791. His splendid eloquence, the charm of his personality, made him the leader of the Girondists, but he was too indolent and unambitious to care for political intrigue, and indeed he was far more of the orator than the statesman. Sent to the Convention by the department of the Gironde, he supported, in the question of the king's trial, the proposal of Salle to make an appeal to the people. When the decisive moment came he voted for death, and as president it was his duty to announce the result. In the struggle with the Mountain he made a

splendid effort, but too late. He was guillotined Oct. 31, 1793, the last of the 21 who died together.

**Verjuice,** a sharp vinegar made of the juice of the crab apple. The sour juice of unripe grapes, used for culinary purposes, is also called verjuice.

**Verlaine, Paul,** a French poet; born in Metz, March 30, 1844. He led a life of vagabondage, vibrating between prison and hospital; but was the most potent factor in modern French poetry. He was the real founder and best exponent of the Symbolic School. He wrote: "Saturnine Poems" (1866); "Gay Festivals" (1869); "Accursed Poets" (1884); "Of Old and of Late" (1885). Among his stories are: "Louise Leclercq" (1886); "Memoirs of a Widower" (1887); "Stories Without Words" (1887); "Love" (1888); "Dedications" (1890); "Good Luck" (1891); "My Hospitals" (1891). He died in Paris, Jan. 8, 1896.



PAUL VERLAINE.

**Vermejo,** or **Rio Grande,** a river of the Argentine Republic, rises in the highlands of Bolivia, and flows in a general S. E. direction till it joins the Paraguay. It is 1,300 miles in length, and has a very tortuous course.

**Vermes,** in zoölogy, the sixth class in the arrangement of Linnæus, comprising all the animals which could not be arranged under Vertebrata and Insecta. He divided the class into five orders: *Intestina, Mollusca, Testacea, Lithophyta, and Zoöphyta.* Also a phylum of the *Metazoa.* It contains a large number of allied animal forms, which may possibly represent more than one phylum. Gegenbaur makes nine classes: Platyhelminthes, Nematelminthes, Chætognathi, Acanthocephali, Bryozoa, Rotatoria, Enteropneusti (Balanoglossus), Gephyrea, and Annulata. This phylum includes the Scolecida, the Annelida, and the Polyzoa of Huxley.

**Vermetidæ,** in zoölogy, a family of holostomatous *Gasteropoda,* with two genera, *Vermetus* and *Siliquaria.* The shells are closely akin to those of the *Serpulæ,* but are distinguished from them by the presence of a spiral nucleus and of concave smooth interior septa.

**Vermetus,** in zoölogy, the worm shell; according to Woodward a genus of *Turritellidæ,* but made by Tate the type of a family, *Vermetidæ,* with 31 recent species from Portugal, the Mediterranean, Africa, and India. Shell is tubular, attached; sometimes regularly spiral when young; always irregular in its adult growth; tube repeatedly partitioned off; aperture round; operculum circular, concave externally. Fossil species 12 from the Lower Greensand of Great Britain, France, etc.

**Vermicelli,** an Italian mixture prepared of flour, cheese, yolks of eggs, sugar, and saffron, manufactured in the form of long slender tubes or threads, and so named from their worm-like appearance. Vermicelli differs from macaroni only in being made in smaller tubes. Both are prepared in perfection at Naples, where they are a favorite dish with all classes, and form a principal item in the food of the population. Vermicelli is used in soups, broths, etc.

**Vermicides.** See VERMIFUGES.

**Vermiculite,** a name given to a mineral occurring in small mica-like scales in steatite, at Milbury, near Worcester, Mass.; crystallization, hexagonal; hardness, 1 to 2; sp. gr., 2.756; luster, like talc; color, grayish. An analysis yielded: Silica, 35.74; alumina, 16.42; protoxide of iron, 10.02; magnesia, 27.44; water, 10.30 = 99.92. Exfoliates on heating, twisting into worm-like bodies. A decomposition product of mica, to which other named substances of similar origin may be referred.

**Vermiform Appendage,** or **Vermiform Appendix,** in comparative anatomy, *appendix cæci vermiformis.* So far as is known, this appendage is peculiar to man, certain of the higher apes, and the wombat. The vermiform appendage in the human species hangs from the cæcum, which is the point of junction between the smaller intestines and the ascending colon. In size and shape it resembles a man's little finger. Its lining membrane secretes a mucus which in health constantly wells up into the lower end of the colon where the ileo-cæcal valve opens, and this mucus acts as a lubricant to the valve. Sometimes the appendix becomes ingested with fæcal matter and serious and even fatal inflammation results. See APPENDICITIS.

**Vermiformes.** a term applied by Newman to worm-shaped or cylindrical caterpillars. He considers it an order of butterflies, and divides it into three families: *Rhodoceridæ,* with the British genera *Colias* and *Rhodocera; Papilionidæ,* with the genus *Papilio;* and *Pieridæ,* with the genera *Leucophasia, Anthocharis, Pieris,* and *Aporia.*

**Vermiformi,** in zoölogy, Rolleston's name for a group of vermes, with a single marine genus, *Phoronis,* with several spe-

cies. It occurs on the British coasts in societies of separate individuals; often placed in the *Serpulidæ*.

**Vermifuges, Vermicides,** or **Anthelmintics,** remedies which possess the property of destroying intestinal worms, or of expelling them from the digestive canal. Those in most common use at the present day are: For tapeworms, extract of male-fern root, in doses of half to one teaspoonful, and turpentine in doses of one to two tablespoonfuls; for round worms, santonin; and for thread worms santonin and saline cathartics by the mouth, but particularly injections by the rectum of common salt, strong green tea, infusion of quassia, or diluted steel drops.

**Vermigli, Pietro.** See MARTYR, PETER.

**Vermilia,** in zoölogy, a genus of *Serpulidæ*, in which the tortuous shell or sheath is attached to some foreign body by its whole length. Found in the seas of Europe. Fossil from the Lower Oölite onward.

**Vermilion** (sulphide of mercury, formula, Hg, 87; S, 13); exists in the native state as cinnabar, from which this beautiful red pigment is obtained by selecting pure pieces and simply grinding them. It is, however, generally made artificially. By one dry process the first step is to prepare an intimate mixture of 100 parts of mercury and 18 parts of sulphur, which are agitated together in revolving vessels till they have combined. The powder so obtained is afterward sublimed in specially constructed retorts, and the purest portion condensed on the heads of the retorts is then treated with a little caustic potash, and washed with warm water. One of several wet processes in use for making vermilion consists in combining mercury and sulphur by grinding them together in the presence of water, caustic potash being afterward added, and the mixture triturated for some hours at a temperature of 113° F. The product is afterward thoroughly washed. The Chinese have long made beautiful vermilion.

**Vermilion Sea,** the Gulf of California, in allusion to the scarlet *infusoria* which infest its waters.

**Vermin,** a generic name given to the smaller animals which damage man's crops or other estate, or prey on his domesticated animals. As thus used vermin includes the smaller mammalia and certain kinds of birds. It is unquestionably from the ranks of the quadrupeds that the great majority of vermin are drawn. Thus in gamekeeper's parlance all the weasel tribe — stoats, polecats, and weasels — are typical vermin. Hedgehogs are equally vermin in his eyes, because he believes they devour the eggs of game — a belief utterly without foundation. The destruction of hedgehogs, in fact, should be discountenanced, considering the service these animals perform in removing noxious insects. Rats and mice, especially field mice and field voles, may increase in such numbers as to destroy large quantities of grain, and thus become decidedly destructive vermin, while serious loss may also be caused to the farmer by hares and rabbits as well as by rodents. Among birds many of the raptores are destructive to game. The falcons, hawks, and kites are vermin in this sense; so also are crows, owls, and magpies; but as the latter feed chiefly on mice and other small quadrupeds they are beneficial to man by repressing animals which are far more typically named vermin than themselves.

In the economy of nature a balance of power is rigidly observed, and in the maintenance of such a balance the so-called vermin play an important part. Too frequently a limited view of the range and functions of a particular animal or group of animals appears to warrant the supposition that extermination by man is necessary. In the majority of cases natural conditions — such as the changing seasons themselves, scarcity of food, or the great development of some special enemies of the race — suffice to repress a prolific species in time. There is thus little need for Malthusian measures and speculations in lower life; only it must be admitted that occasionally, and during the over-prolific period in the history of animal species, man requires to take measures for the repression of his lower neighbors. Agriculturists in particular, are beginning to recognize the truth of the statement that the birds which visit their fields are of extreme value in the repression of the insects and their larvæ which feed on the tender shoots of the grain. And even admitting that the fields may occasionally suffer from the visitation of common birds, the damage inflicted thereby is but trifling when compared with their services in repressing the insect species. Even the much persecuted mole has been shown by Darwin to be a thorough fertilizer of the ground, and the earthworm itself acts in this way also. Both animals, in fact, by their operations in turning over the soil, in bringing fresh layers to the surface, and in breaking the clods, tend to open up the ground, and thus to ensure favorable conditions for the germination of the seed. And the despised and hunted rats may be shown, like the whelks and crabs of the sea, to play no unimportant part in nature's sanitary arrangements, by the wholesale destruction of offal and garbage in which they indulge.

As means of repressing vermin, traps and snares of various kinds are in use. Spring traps of ordinary kind, and the stamp traps with powerful teeth, are in use for the capture not merely of rats, but of foxes, weasels, and the like. Other traps, in the form

of boxes, the entrance to which is closed by the act of the animal in entering, are also in use, and "falls," or traps in which a prop is pushed from under a box as the animal passes below to secure the bait, are well-known contrivances used in the capture, not merely of rats, but of larger quarry. Large numbers of field voles, etc., may be killed by digging shallow pits, these animals being unable to climb out. The poisons in common use for rats include arsenic and phosphorus. Rats may be suffocated in barns, etc., by the production of carbonic acid fumes, and by thoroughly closing the doors and windows for a day or two.

**Vermont,** a State in the North Atlantic Division of the North American Union; bounded by Quebec, New Hampshire, Massachusetts, and New York; admitted to the Union, March 4, 1791; number of counties, 14; capital, Montpelier; area, 9,563 square miles; pop. (1890) 332,422; (1900) 343,-641; (1910) 355,956.

*Topography.*—The surface of the State is mountainous, being traversed from N. to S. by the Green Mountains, which culminated in Mansfield Mountains in the N. W. with an altitude of 4,300 feet. The State is drained in the E. by the affluents of the Connecticut river, which forms its entire E. boundary line, and in the W. by those rivers entering Lake Champlain, which forms over one-half its W. boundary. The principle rivers are the Passumpsic, Wells, White, Black, West, and Deerfield, flowing into the Connecticut; and Otter Creek, Winooski, Lamoille, and Missisquoi emptying into Lake Champlain. Lake Memphremagog on the Canadian border receives the Clyde and several other small streams. The rivers are not navigable, but afford excellent water power. There are numerous small lakes, the principal ones being Willoughby, Maidstone, Seymour, Dunmore, Austin, and Bombazine. Several large islands in Lakes Champlain and Memphremagog belong to the State, North and South Hero, Isle la Motte, and the peninsula of Alburg, with the former, constituting Grand Isle county.

*Geology and Mineralogy.*—The principal geological formations are of Azoic and Silurian origin, the entire State being covered with glacial drift. Laurentian deposits occur in the S. W., and Lower Silurian and Primordial rocks occur along Lake Champlain. Old sea beaches, lake and river terraces, and terminal moraines abound in fossils, and make geological research exceedingly interesting. The State is famous for its marbles. They occur in many localities, especially in Bennington and Rutland counties, and are found in many colors. Iron, silver, gold, galena, and zinc occur in small deposits, and other mineral products are amethysts, feldspar, mica, chalcedony, jasper, garnets, tourmaline, and asbestos. The principal mineral productions in 1900 were granite, $1,113,788; slate, $917,462; marble, $2,484,852; limestone, $188,100; total stone output, $4,704,202; mineral waters, 67,844 gallons, valued at $19,453; and clay products, $131,525. The State ranks first in the Union in the value of its marble output, second in total stone production, and third in granite.

*Agriculture.*—Vermont is a farming State and produces all the cereals, but stock raising and dairy farming are the principal agricultural industries. It is especially noted for its production of maple sugar. The principal farm products in 1900 were corn, 1,939,080 bushels, valued at $969,540; wheat, 81,992 bushels, valued at $63,954; oats, 3,719,677 bushels, valued at $1,339,084; barley, 500,811 bushels, valued at $260,422; buckwheat, 238,375 bushels, valued at $119,188; potatoes, 3,305 bushels, valued at $1,322,098; and hay, 1,066,524 tons, valued at $11,785,000.

*Manufactures.*—The extensive water power, timber land, and stone quarries, of Vermont give it a prominent place among manufacturing States. In 1900 there were reported by the United States census 4,817 manufacturing establishments employing $48,962,114 in capital and 29,575 persons; paying $12,249,695 in wages, and $29,965,-851 for material used; and having finished products valued at $57,872,769. The principal articles of manufacture are lumber and timber, dairying products, marble and granite tombstones and monuments, paper and wood pulp, flour and grist, woolen goods, hosiery and knit goods.

*Banking.*—On Oct. 31, 1901, there were reported 47 National banks in operation, having $6,495,000 in capital, $4,379,474 in outstanding circulation, and $4,282,500 in United States bonds. There were also 41 mutual savings banks with $40,209,059 in savings deposits.

*Education.*—At the end of the school year 1899–1900 the children of school age numbered 84,720; the enrollment in public schools, 65,964; and the average daily attendance 47,020. There were 2,240 public school buildings, public school property valued at $1,800,000, and 3,742 teachers. The receipts for the year amounted to $887,-624, and the expenditures, $1,074,222. For higher education there were 58 public high schools, 21 private secondary schools, 3 public normal schools, the University of Vermont, and State Agricultural College, at Burlington; Middlebury College, at Middlebury, and Norwich University, at Northfield.

*Commerce.*—The imports of merchandise at the ports of Memphremagog and Ver-

VERMONT AND NEW HAMPSHIRE
SCALE OF MILES
0 5 10 20 30 40
State Capitals
County Seats
A B C D E F
73° 72° 30′ 72° 71° 30′ 71°
45° 44° 30′ 44°
QUEBEC
FRANKLIN
ORLEANS
LAMOILLE
CALEDONIA
CHITTENDEN
WASHINGTON
ORANGE
ADDISON
COOS
ESSEX
GREEN MOUNTAINS
WHITE MOUNTAINS
LAKE CHAMPLAIN
BURLINGTON
Montpelier
St. Albans
Newport
Colebrook
Lancaster
St. Johnsbury
Littleton
Berlin
Gorham
Middlebury
Vergennes
Barre
Waterbury
Morristown
Hyde Park
Danville
Lyndon
Island Pond
Northfield
Williamstown
Haverhill
Newbury
Richford
Enosburg
Swanton
Highgate
Fairfield
Milton
Cambridge
Colchester
Winooski
Essex
Stowe
Richmond
Jericho
Hinesburg
Charlotte
Shelburne
Bristol
Ferrisburg
Groveton
Northumberland
Whitefield
Jefferson
Pittsburg
Clarksville
Stewartstown
Memphremagog Lake
Missisquoi Bay
Connecticut R.
Androscoggin
Umbagog L.
Richardson L.
Mooselocmaguntic L.
Rangeley L.
Kennebago L.
Parmachenee L.
Mt. Washington
Mt. Adams
Mt. Madison
Mt. Jefferson
Mt. Monroe
Mt. Lafayette
Mansfield Mt.
Camels Hump
Moosilauke Mt.

Hammond's 8 x 11 Map of Vermont and New Hampshire
Copyright, 1907, by C.S. Hammond & Co., N.Y.

A 73° B 72° 30′ Longitude C West 72° from D Greenwich 71° 30′ E 71° F

mont, during the year 1900 aggregated in value $6,030,534; and the exports, $12,157,996. A large part of the trade between the United States and Canada is carried on through these ports.

*Churches.*— The strongest denominations in the State are the Roman Catholic; Congregational; Methodist Episcopal; Regular Baptist, North; Presbyterian; Protestant Episcopal; Universalist; Freewill Baptist; and Spiritualist. In 1899 there were reported 778 Evangelical Sunday-schools with 7,000 officers and teachers, and 54,755 scholars.

*Postoffices and Periodicals.*— On Jan. 1, 1901, there were 576 postoffices of all grades, and 77 periodicals, of which 9 were daily, 2 semi-weekly, 55 weekly, 1 bi-weekly, and 10 monthly.

*Railroads.*— The total length of railroads within the State on Jan. 1, 1901, was 1,031 miles, of which 30 miles were constructed during the previous year.

*Finances.*— The total debt of the State on July 1, 1901, was $333,966; and the cash on hand and in banks was $101,560. The assessed property valuation was real estate, $118,950,024; personal property, $58,293,598; total, $177,243,622. The State tax rate was $2.00 per $1,000, besides $.50 per $1,000 for school and highway tax.

*State Government.*— The Governor is elected for a term of two years and receives a salary of $1,500 per annum. Legislative sessions are held biennially and are unlimited in length. The Legislature has 30 members in the Senate and 245 in the House, each of whom receives $3.00 per day and mileage. There are 2 Representatives in Congress. The State government in 1902 was Republican.

*History.*— The first settlement by whites was made in 1724 on the site of the present town of Brattleboro. Immigration began to pour in in 1760–1768, during which period the soil had been claimed as part of the New Hampshire grant; whereupon, a counter claim was put forth by the governor of New York, under virtue of the grants from Charles II. to his brother, the Duke of York. On an appeal to the English crown, jurisdiction over the new territory was decided in favor of New York. This was the precursor of an armed strife which continued for 10 years between the New York authorities and the Vermont settlers under the leadership of Ethan Allen and others. This state of things was partially interrupted by the outbreak of the Revolutionary War. In 1777 Vermont declared her independence, and sought admission into the National Confederation. Difficulties intervened, however, and it was not till 1791 that she was admitted into the Union; having previously bought off the claims of New York with the sum of $30,000. Though not at the time a member of the confederated colonies, Vermont had played a distinguished part in the war of independence, and her "Green Mountain Boys" participated in some of the hardest fought battles of the war. In the War of 1812, the Vermonters added fresh laurels to their military record. During the Civil War Vermont furnished more than her quota of men, sending more than one-tenth of the whole population.

**Vermont, University of,** and **State Agricultural College,** a coeducational, non-sectarian institution in Burlington, Vt.; chartered in 1791; opened in 1800; has an endowment exceeding $675,000; grounds and buildings valued at over $1,000,000; scientific apparatus, etc., $85,000; volumes in the library, about 80,000; average faculty, 90; average students, 560; graduates, over 4,400.

**Vernal Grass, Sweet** (*Anthoxanthum odoratum*), a grass very common in Great Britain and throughout Europe and the N. parts of the world generally, growing in meadows, woods, and pastures. It is about a foot high, with spiked oblong panicle, the flowers remarkable as having only two stamens. The spikelets are one-flowered; the glumes very unequal; the floret accompanied by two rudimentary florets. It is relished by cattle, and is sown along with other grasses to form permanent pastures. The pleasant smell of newly-mown hay is often chiefly owing to this grass, which is fragrant when drying, and contains coumarin. It yields by distillation an essential oil of an agreeable odor. The straw is of use for the finest kinds of straw plaiting.

**Vernation,** in botany, the manner in which the young leaves are arranged within the leaf-bud. It is of great practical importance for distinguishing species, genera, and even natural orders. Thus the vernation of the cherry is conduplicate, that of *Prunus domestica* convolute, and that of ferns and cycadaceæ circinate. Called also præfoliation.

**Verne, Jules,** a French novelist; born in Nantes, France, Feb. 8, 1828. He studied law for some time, but afterward began writing short pieces for the stage. In 1863 he published "Five Weeks in a Balloon," and the vein of the marvelous, tinged with a quasi-scientific truthfulness, was worked by him with great success. His more popular works are: "Twenty Thousand Leagues under the Sea," "From the Earth to the Moon," "Across Africa in a Balloon," "Michel Strogoff," "To the Center of the Earth," "Round the World in Eighty Days," "The Mysterious Island," etc. Most of his works have been translated into English and German. He died March 24, 1905.

**Verner, Karl Adolph,** a Danish philologist; born in Aarhus, Denmark, March 7, 1846; was educated at the University of Copenhagen. In 1876–1883 he was assistant librarian at Halle University. He was then made Professor of Slavonic Languages at the University of Copenhagen. He was the author of "An Example of the First Permutation of Consonants" in "Kuhns Zeitschrift" (1875). This article was widely read and had much influence. He also wrote a number of other articles for linguistic periodicals.

**Vernet, Jean Emile Horace,** a French painter; grandson of Claude Joseph Vernet, a distinguished painter of sea pieces and seaport scenes; son of Antoine Charles Horace Vernet, painter of battle and genre pictures; born in Paris, France, June 30, 1789. His first master in art was his father, and at an early age he acquired the favor of the imperial court by his battle pieces, in which he adopted a realistic treatment in opposition to the classical school of David. His pictures connected with the wars of Napoleon are very numerous. In 1828 Charles X. appointed him director of the French Academy in Rome, a post he ably filled till the end of 1834, producing a series of pictures, partly historical, partly genre. Louis Philippe then commissioned him to paint galleries of the museum at Versailles with scenes relating to the conquest of Algeria, a country which he several times visited. In 1840 we find him traveling in Egypt, Palestine, and Syria; in 1842 he accompanied the Emperor Nicholas on a journey from St. Petersburg to Sebastopol; and in 1845 he visited Spain and Algeria. In 1853 he followed the French army to Varna, but soon returned to Paris and produced his last great picture, "The Battle of the Alma." He died in Paris, Jan. 17, 1863.

**Vernier** (named after the inventor, Peter Vernier, of Brussels, who described it in a tract printed in 1631), a contrivance for measuring fractional portions of one of the equal spaces into which a scale or limb, or a graduated instrument is divided. The vernier consists of a graduated scale, so arranged as to cover an exact number of spaces on the primary scale, or limb, to which it is applied. The vernier is divided into a number of equal parts, greater or less by 1, than the number of spaces which it covers on the limb. The vernier scale is 1 1-10 inches in length, and is divided into 10 equal parts, each embracing 11-100 of an inch, and therefore exceeding each division of the scale by 1-100 of an inch. If, therefore, any division of the vernier coincide with a division on the scale, that division, counting downward, when the 0 of the vernier coincides with the top of the mercurial column, indicates the number of hundredths of an inch to be added to the tenths division on the scale next above which the 0 of the vernier stands.

**Vernon, Edward,** a British naval officer; born in Westminster, England, Nov. 12, 1684; was well educated, and following a strong natural bent, entered the royal navy. He served in the battle of Vigo Bay, Oct. 12, 1702, and with Sir George Rooke at Malaga in 1704, and soon got a captaincy. Made M. P. for Penryn (1727), and for Portsmouth (1734–1741), he boasted in the House of Commons that he could take Porto Bello with six ships. Sent off with the specified number of vessels, he fulfilled his boast, Nov. 22, 1739. In 1741, however, he failed in his attack on Cartagena, but his popularity was undiminished, and he long represented Ipswich in Parliament. Smollett, who accompanied him to Cartagena, has immortalized the expedition in "Roderick Random." In 1746 he was removed from the list of admirals, through a dispute with the admiralty. Vernon published "A New History of Jamaica from the Earliest Account to the taking of Porto Bello" (1740), and "Original Papers Relating to the Expedition to Panama" (1744). He died in Nacton, Suffolk, Oct. 29, 1757.

**Vernon-Harcourt, Levison Francis,** an English engineer; born in London in 1839; was educated at Oxford University, and studied under Sir John Hawkshaw in 1862–1865, and later was his assistant. He began practice as an hydraulic engineer in London in 1875, and became an expert on canals, water supply, etc., before committees of the House of Lords. He was also employed by the Mersey Dock Board and the Northwestern Railway as an expert on the Manchester ship-canal; became Professor of Civil Engineering at University College, London. His publications include: "Rivers and Canals" (1882); "Harbors and Docks" (1885); "Achievements in Engineering" (1891); "River Engineering and Water Supply" (in the "Encyclopædia Britannica"); etc. He died Sept. 14, 1907.

**Vernonia** (named after William Vernon, a botanical traveler in North America), a large genus of *Heterocomeæ*, the typical one of *Vernoniaceæ*. Style cylindrical, with tapering branches, everywhere covered with bristles. More than 400 species are known, chiefly from the hotter parts of the Western Hemisphere. The seeds of *V. anthelmintica* (=*Serratula anthelmintica* of Roxburgh), a plant found in the Himalayas and some other parts of India, yield an oil. The seeds themselves are a valuable tonic and stomachic, and are said to be diuretic. They are used as an anthelmintic, and bruised and mixed with lime-juice to destroy pediculi. The Hindus consider them of great use in white leprosy and other

skin diseases. A decoction of *V. cinerea*, another Indian species, is used in India to promote perspiration.

**Vernoniaceæ,** in botany, a tribe of Tubulifloræ. Style cylindrical, its arms generally long and subulate, occasionally short and blunt, wholly covered with bristles. Sub-tribes: Ethulieæ, heterocomeæ, elephantopeæ, rolandreæ, bojerieæ, liabeæ, and pectideæ.

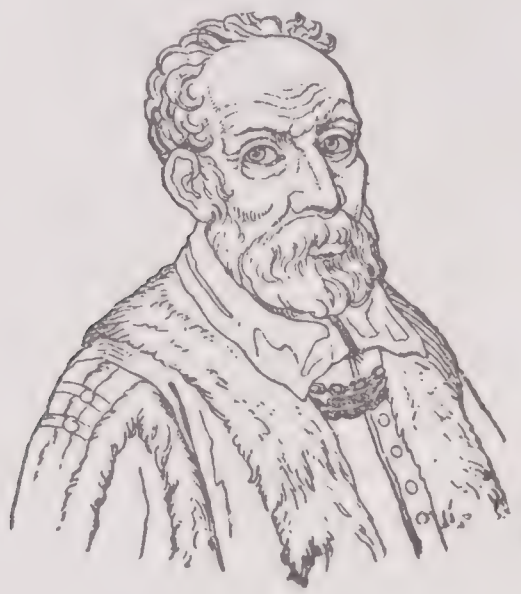
**Verona,** an ancient city of Northern Italy; capital of the province of the same name; picturesquely situated at the foot of the Tyrolese Alps, and on both banks of the Adige; 72 miles W. by N. of Venice. It is a member of the famous Quadrilateral, having fortifications of unusual strength, and is interesting no less as a great center of historical associations than as a celebrated home of art, rich in classical and mediæval monuments of architecture. The Adige is here crossed by five bridges, and on the tongue of land on the W. side lies by far the greater part of the city. Foremost among the antiquities is the amphitheater, probably erected under Diocletian (A. D. 284), and which brings out in its full perfection the massive grandeur of the true Roman style. It is 106 feet high and 528 yards in circumference, and rises in 45 tiers of gray marble steps, capable of accommodating 25,000 spectators sitting, and 70,000 standing. Most of the outside range of arches is lost, but the internal seats have been wonderfully preserved by a custom of repairing them which has gone on unbrokenly through all the ages, and which has become a part of the history of the building. Another antiquity, the great gate of Verona, the Porta de Borsari, now spanning one of the busiest streets, was erected by Gallienus in A. D. 265. Among the other Roman remains is the Arco dei Leoni. In the architecture of Verona there is a gap extending from the 3d to the 12th century from the amphitheater in the days of Diocletian to the Church of San Zeno in the time of Friedrich Barbarossa. The latter edifice is the great example of what Freeman very aptly calls "the barbaric form of Italian Romanesque." The nave in its present form was begun in 1139, and the choir dates from the 13th century. A notable feature is the great Campanile; the projecting portal rests on lions of red marble, the interior has an open roof supported by fine pillars and columns.

The cathedral of Santa Maria Matricolare is an imposing Gothic structure of the 14th century. At the portal are Roland and Oliver, the paladins of Karl the Great, and over the altar is a celebrated Assumption by Titian. The little church of St. Stephen on the E. or Theodoric's side of the river at one time disputed with the great Duomo the first place among the churches of Verona, as the seat of her bishops in life, and their resting place in death. Other notable churches are the Gothic S. Anastasia (begun 1261), with marble façade; S. Giorgio in Braida (1604), designed by Sammichelfi, and adorned with pictures by Tintoretto, Veronese, etc.; S. Fermo Maggiore, of the 14th century, with rich interior; and S. Nazzaro e Celso, a work of the Renaissance. Verona has many fine palaces, including the Palazzo del Consiglio ("La Loggia"), restored in 1873, with statues of famous Veronese, comprising Cornelius Nepos, Catullus, Vitruvius, the younger Pliny, Æmilius Macer, etc.; and the Palazzo Pompei alla Vittoria, now containing the Civic Museum and valuable picture gallery. A unique Gothic structure is the tomb of the Della Scala family, who were presidents of the republic of Verona for upward of a century. On the left bank of the Adige rises the Castello S. Pietro, the stronghold of Theodoric, which was remodeled by Galeazzo Visconti in 1393, and which, after being dismantled by the French (1801), was refortified by the Austrians in 1849. The adjoining Giardino Guisti is noted for its venerable cypresses, some of which are over 400 years old, and attain a height of 120 feet.

The seat of a bishop, a prefect, a tribunal, a commander-general, etc., Verona has numerous educational and benevolent institutions. There is an important transit trade with Germany, and among the leading manufactures are silks, woolens, cottons, musical instruments, furniture, etc. Verona is one of the oldest towns of Italy, its earliest inhabitants being either the Euganei or the Celtic Cenomani. It became a flourishing colony under the Romans. Here Decius defeated the Emperor Philip in 249, Constantine overthrew the army of Maxentius in 312, and Stilicho hurled back the hosts of Alaric in 403. After his defeat of Odoacer (489) at Verona, Theodoric made it his alternative residence, and it was subsequently called Wälsch-Bern, or Dietrichs-Bern, to distinguish it from "Verona in montibus." The city suffered during the Ghibelline wars, but prospered under the Scaligers (1262–1387), who were succeeded by the Visconti and Carrara families. It escaped the tyranny of hereditary rulers by transferring its allegiance in 1405 to Venice, whose fortunes it subsequently shared. Pop. (1901) 74,271.

**Veronese, Paul (Paolo),** the name by which Paolo Caliari (or Cagliari), an Italian artist of the Venetian school, is usually known, from his having been born at Verona, probably in 1528. A sculptor's son, he studied painting under an uncle, Antonio Badile, and, after some work in his native city and Mantua, in 1555 settled in Venice, where he rapidly acquired both wealth and

reputation. He had for contemporaries both Titian and Tintoretto, and, though 50 years Titian's junior, was held in equal admiration with these famous painters. The Church of San Sebastiano, in Venice, contains many of his pictures (both frescoes and easel pictures, from the story of Esther, martyrdoms, etc.) which are reckoned the most important of his earlier period — the period before his visit to Rome (1563), when he first became acquainted with the masterpieces of Raphael and Michæl Angelo. The influence of the Roman school on his style was marked, new dignity, grace of



PAUL VERONESE.

pose, and ease of movement being added to his rich Venetian coloring; a specific decorative element is also hereafter more conspicuous. He was kept busy with innumerable commissions, some of which he executed elsewhere than at Venice (as at Vicenza and Treviso). Veronese is remarkable more for the fertility than for the depth or spirituality of his imagination. His design is generally noble, his composition rich, and his execution truthful. In the invention of details, especially, he is inexhaustible, and often overloads his pictures with ornament. One peculiarity of his works is the frequent introduction of splendid architectural backgrounds, which, however, were frequently painted by his brother Benedetto. The most celebrated of his works — many of them very large — is the "Marriage Feast at Cana of Galilee," now in the Louvre at Paris; it is 20 feet high, and 30 in length, and contains 120 figures, many of them portraits of contemporaries, and the details much more 16th-century Italian than ancient Jewish. Besides these may be mentioned: "The Calling of St. Andrew to the Apostleship," "The Feast of Simon," and (in the National Gallery) the "Presentation of the Family of Darius to Alexander," and "St. Helena's Vision of the Invention of the Cross"—the former purchased for $65,000, and the latter for over $15,000. Veronese was the last of the great Venetian painters. He died in Venice, April 19, 1588, and was buried in San Sebastiano.

**Veronica,** a saint of the Roman Catholic Church, who, according to the legend, was one of the women who met our Lord on his way to Calvary. As he was sinking, overpowered by fatigue, under the weight of the cross, Veronica offered him her veil, to wipe the sweat from his brow, when, wondrous to tell, the divine features were miraculously impressed on the cloth, and remained as a permanent picture of the face of our Iord. This miraculous picture is reported to have been preserved in Rome at St. Peter's Church from about the year 700. Another, of similar appearance, is preserved at Milan. Many Catholic writers have supposed that the name Veronica is but founded on an erroneous application of what in reality was meant to designate not the personage, but the picture, which was described as *vera icon*, "the true image" (*i. e.*, of Christ).

**Veronica,** in botany, the speedwell; the typical genus of *Veroniceæ;* herbs or shrubs, generally with opposite, sometimes with whorled leaves; calyx four to five partite; corolla rotate, four cleft, the lowest segment the narrowest; stamens two; capsule two-celled. Known species about 160, from the N. temperate zone and from Australia and New Zealand. All have a certain delicate beauty. One of the finest is *V. chamædrys,* frequent in May and June in woods, pastures, and on hedge banks. Its stem has the soft hairs disposed on two opposite lines, changing their position above each joint; the leaves are wrinkled, the corolla very bright blue. *V. officinalis,* a pubescent plant, with a procumbent stem, ovate-serrate leaves, and spicate racemes, is abundant in woods and pastures; its bitter and astringent leaves infused make a kind of tea, which has been used medicinally. Other somewhat common species are *V. arvensis, V. agrestis, V. serpyllifolia, V. montana,* and *V. hederæfolia.*

**Verplanck, Gulian Crommelin,** an American author; born in New York city, in 1786. He published anonymously in 1819 a brilliant satirical work, entitled: "The State Triumvirate." In 1825 he was elected to Congress, and published, 1827–1830, conjointly with William Cullen Bryant and Robert C. Sands, a miscellany entitled "The Talisman." Among his other works are his address before the New York Historical Society entitled "The Early European Friends of America" (1818); "Essays on the Nature and Uses of the Evidences of Revealed Religion" (1824); and "Discourses and Addresses on Subjects of American History, Art, and Literature"

(1833). In 1846 he brought out his edition of Shakespeare, with notes, esteemed one of the best that had ever appeared. He died in New York city, March 18, 1870.

**Verres, Caius,** a Roman governor, notorious for his rapacity and cruelty; born about 112 B. C. He was quæstor in 82, and city prætor at Rome in 74 B. C. He was governor of Sicily in 73–71, and almost ruined that island by his extortions and vexatious measures, and by his plunder of property and art treasures. He was brought to trial and defended by Hortensius, while Cicero conducted the prosecution. The trial was one of the most celebrated in the history of Rome. Verres absconded before the trial ended and fled to Marseilles, where he remained in exile 27 years. He died about 42 B. C.

BAPTISM OF CHRIST BY VERROCCHIO.

**Verrazano, Giovanni da,** an Italian navigator; born near Florence presumably about 1480; joined the French maritime service in 1505 and soon became an experienced navigator. In 1512 he was employed by France as a privateer against Spanish merchantmen and made many captures. In 1523 he took the treasure ship sent by Cortés to Charles V., which contained plunder from Montezuma estimated at $1,500,000 in value. In January, 1524, he made an exploring expedition to North America, and after discovering land near Cape Fear sailed N. and entered either New York or Narragansett Bay. He then sailed 450 miles N. E. and returned to France. On July 8, 1524, he sent a letter to King Francis I., in which he claimed to have discovered 700 leagues of coast. Little is known of his subsequent history. It is supposed that he was taken prisoner off the S. coast of Spain and executed as a pirate in Pico, New Castile, in November, 1527.

**Verrocchio, Andrea del,** an Italian sculptor and painter; born in Florence, Italy, in 1435. First a goldsmith, he became a sculptor almost equally skilled in working marble and bronze. Only one extant picture can be certainly attributed to

ANDREA DEL VERROCCHIO.

him, a "Baptism of Christ" in the Florentine Academy, and in this, according to Vasari, an angel's head was by Leonardo da Vinci. Of his bronze statues the "David" and the "Unbelieving Thomas" in Florence, and the great equestrian statue of Bartholommeo Colleoni at Venice, are among the most notable. He died in Venice in 1488.

**Verrucæ,** in botany, warts or sessile glands. They vary greatly in figure, and may be round, oblong, reniform or cupulate, cylindrical, or conical. In cassia they are seated upon the upper edge of the petiole, in the *Cruciferæ* they rise from the base of the ovary, and in the leafless acacias they are on the upper edge of the phyllodium.

**Verrucaria,** in botany, the typical genus of *Verrucaridæ* and *Verrucariæ*. They have a thin crust producing gonidia. Generally distributed over the world, but the finest species are from the tropics. *V. submersa* is nearly aquatic, a very exceptional character among lichens.

**Verrucariæi,** an order of lichens of the angiocarpous division. They are found on the trunks of trees, on rocks, and occasionally on pebbles immersed in water.

**Verrucidæ,** in zoölogy, a family of sessile Cirripedes, order *Thoracica*, with a single genus, *Verruca*. Shell of six valves, unsymmetrical, the scuta and terga, which together form the operculum, movable, but not furnished with a depressor muscle. From the Chalk onward.

**Verrugas,** a stream in a rocky ravine among the lofty mountains over and through which runs the Central Railway of Peru. Over a rocky ravine stood a bridge of three iron piers (the central one 252 feet high), which, built in 1873, was swept away by a flood in 1889. Its successor, finished in 1891, has but two piers, and the lofty central span is 585 feet long.

**Versailles,** a city of France; capital of the department of Seine-et-Oise; on a plain 11 miles S. W. of Paris. A city more of pleasure than of industry, long accustomed to find its sustenance in the expenditure of a luxurious court, and subsequently a place of residence for many foreigners, attracted there by the salubrity of the climate, the fine promenades, and the economy of living, as compared with that in Paris, it has few manufactures and little trade. The town covers a large area in proportion to its population, and is of remarkably regular construction, consisting of long and straight streets, crossing at right angles. It is the see of a bishop, and contains a public library of 50,000 volumes, many palatial edifices, public fountains, spacious squares, and elm-planted avenues. The great attraction of Versailles is its palace, and the history of this structure may be said to be the history of the town. Louis XIII. built a hunting lodge here, afterward extended into a château. The site occupied by the palace is known to have been that of the ancient priory of St. Julien. Louis XIV. devoted enormous sums to its embellishment, or rather reconstruction, under the care of Mansard; and Louis XV. altered the arrangement of the interior. Here was signed in 1783 the peace of Versailles between England and the United States. Under Louis XVI. Versailles continued to be one of the usual residences of the court down to the period of the Revolution, which great event had its beginning here in the meeting of the States-General in May, 1789. At this date the population was 100,000; the palace and its park, the perfection of formal landscape gardening, have been the model of many capitals. Louis Philippe transformed the palace of Louis XIV. into a museum, to contain trophies of the victories of France. The approach to the palace is by the Place d'Armes and the Cour d' Honneur, in the latter of which are a large equestrian figure of Louis XIV. and other statues. The entire length of the palace is nearly 1,400 feet. The collections embrace pictures of events in French history, portraits of French heroes, etc. The most interesting are the pictures by David which illustrate the career of Napoleon, those by Horace Vernet, and some by Ary Scheffer and Delacroix. The gardens, with their broad terraces and long alleys, are imposing, but formal; the fountains are on the grandest scale. From the middle of September, 1870, till the conclusion of peace in 1871 Versailles was the center of all the operations of the Germans. On September 20 King William and the Crown Prince entered the town; and there, on Jan. 18, 1871, the former was proclaimed Emperor of Germany. On Jan. 28 the capitulation of Paris was signed in Versailles; after the peace it was the seat of the National Assembly and government till 1879, and headquarters of the army during the Commune. Pop. (1906) 54,820.

**Verse,** a measured and cadenced form of speech or composition, usually adopted in poetry. It seems to be the natural language of passion, yet it has unquestionably been improved and developed by art. The use of rhymed cadences is a comparatively modern invention. Grammarians have elaborately classified the varieties of verse, and analytically distinguished the possible divisions of words into bars of accented and unaccented syllables. The term is also applied to a line of poetry consisting of a certain number of metrical feet disposed according to the rules of the species of poetry which the author intends to compose. Verses are of various kinds, as hexameter, pentameter, etc. Blank verse is verse in which the lines do not end in rhymes. Heroic verse is rhymed verse in which the lines usually consist of 10 syllables, or in English of five accented syllables, constituting five feet.

**Verst,** a Russian measure of length, equal to 3,500 English feet, or very nearly two-thirds of a mile.

**Vertant,** in heraldry, the same as flected or reflected, formed like the letter S reverted.

**Vertebra,** in comparative anatomy, one of the bony segments of which the spine, or backbone, consists. Theoretically, a typical vertebra consists of a central piece or body, from which two arches are given off, one (the neural), protecting the nervous system, the other (the hæmal) protecting the organs of circulation, and thus corresponding to the doubly tubular structure of the body of the Vertebra. In practice the second arch is only recognizable with difficulty, the parts being either absent or much modified, but a good example may be seen in the human thorax. The fundamental element of each vertebra is the body or centrum, from the surface of which spring two bony arches, called the neural arches, or neurapophyses, because they form with the body the neural canal, which incloses the spinal cord. From the point of junction there is usually developed a spine, called the spinous process, or neural spine, rudimentary in the atlas or first cervical vertebra. From the neural arches are also de-

veloped the articular process or zygapophyses, which aid the centra in uniting the vertebræ to each other. From the sides of the body proceed the transverse processes. The number of vertebræ varies greatly in different animals. The vertebral column is divisible into distinct regions, of which the following are recognizable in the higher Vertebrata: The cervical vertebræ (seven in man), composing the neck; the dorsal (12 in man), usually carrying well-developed ribs; the lumbar (five in man) These form the cervical, dorsal and lumbar regions respectively, and are sometimes called true vertebræ, to distinguish them from the false vertebræ, which consists of those in the sacral region usually anchylosed to form a single bone, the os sacrum, and a variable number of vertabræ forming the caudal region or tail. The spaces between the vertebræ are filled with an elastic substance, admitting of an amount of motion which, though slight between each pair, is in the aggregate sufficient to give the spinal column considerable flexibility. The vertebræ and their projections or processes afford attachments for a number of muscles and ligaments, and passages for blood vessels and for the nerves passing out of the spinal cord.

**Vertebrata,** in zoölogy, a division of the animal kingdom, instituted by Lamarck, comprising animals in which the body is composed of a number of definite segments, arranged along a longitudinal axis; the nervous system is in its main masses dorsal, and the neural and hæmal regions of the body are always completely separated by a partition; the limbs are never more than four in number; generally there is a bony axis known as the spine or vertebral column, and a notochord is always present in the embryo, though it may not persist in adult life. A specialized hæmal system is present in all, and in all but *Amphioxus* there is a heart with never less than two chambers, and in the higher vertebrates with four. The vertebrata are usually divided into five classes: Pisces, Amphibia, Reptilia, Aves, and Mammalia, and many attempts have been made to gather these classes into groups. One plan is to divide them into branchiata (fishes and amphibians), because at some portion of their life they are provided with gills, and abranchiata reptiles, birds, and mammals), having no gills. The latter are sometimes called amniota or allantoidea, because the embryo is provided with an ammon and an allantois, while both these are absent in the branchiata, which are therefore called anamniota or anallantoidea. Owen made two sections: Hæmatocrya, or cold-blooded vertebrates (fishes, amphibia, and reptiles), and Hæmatotherma, or warm-blooded vertebrates (birds and mammals); and Huxley three: Ichthyopsida (fishes and amphibia), sauropsida (reptiles and birds), and mammalia. A later classification is to treat all the vertebrata as a division of a larger group, Chordata, distinguished by (1) the temporary or permanent possession of a rod (the notochord) underlying the central dorsally-placed nervous system; and (2) the temporary or permanent presence of visceral clefts. The Choradata are divided into three groups: (1) cephalochordata, in which the notochord, pointed at the extremities, extends from one end of the body to the other; (2) urochordata, and (3) the true vertebrata, or craniata, in which the anterior end of the central nervous system is enlarged into a brain, which becomes surrounded and protected by a cartilaginous capsule or skull.

**Vertical Circle,** in astronomy the intersection of the celestial sphere by any plane which contains the vertical line of any place. The meridian is the N. and S. vertical circle, and the E. and W. one is called the prime vertical. All vertical circles are at right angles to the horizon. The name is also used to indicate a form of instrument long in use at the Pulkova Observatory, for the measurement of zenith distances, and with which the most accurate determinations of star declinations thus far known have been made.

**Vertical Fins,** fins situated in the median dorsal line from the head to the tail, and in the ventral line of the tail. Sometimes the vertical fins are continuous, or nearly so, but usually three vertical fins are distinguished — one in the dorsal line (the dorsal fin), one in the ventral line behind the anus (the anal fin), and one confined to the extremity of the tail (the caudal fin), called also unpaired fins.

**Verticil,** or **Verticel,** a term applied (1) to leaves when they stand around the stem in a circle, or when more than two of them are opposite; (2) to flowers when two verticillasters are united; (3) more rarely to branches when several spring from the stem at the same height. The use of the word was introduced by Linnæus. Link used the expression spurious verticil or false whorl.

**Vertigo.** See Megrims.

**Verticillaria,** in botany, a genus of *Clusieæ,* containing one species, *V. acuminata,* a Peruvian tree with acuminate leaves, two colored sepals, and many stamens, and a three-valved capsular fruit.

**Verticillaster,** in botany, Hoffmansegg's name for a cyme reduced to a very few flowers. This is the normal inflorescence in the *Lamiaceæ,* in the species of which two verticillasters are situated opposite to each other in the axils of opposite leaves.

**Vertot d'Aubœuf, René Aubert de,** a French historian; born in Château Benetot (Eure), Nov. 25, 1655. He was historiographer of the Order of Malta. He published a "History of the Revolutions of Portugal" (1689); "History of the Revolutions of Sweden" (1696); "History of the Revolutions of the Roman Republic" (1719); "History of the Order of Malta" (1726); all more dramatic and fluent than reliable. He died in Paris, June 15, 1735.

**Vertue, George,** an English engraver; born in Westminster in 1684. He enjoyed the patronage of Sir Godfrey Kneller, and became engraver to the Society of Antiquaries in 1717. His best known works include 12 portraits of poets and 10 portraits of Charles I. and his friends. He died in London, July 24, 1756.

**Vertumnus,** a Roman deity who presided over crops and orchards. He is generally represented as a young man crowned with flowers, and holding in his right hand fruit, and a horn of plenty in his left. He was the husband of Pomona.

**Verviers,** a town of Belgium; in the province of Liége, on the Vesdre, 14 miles E. S. E. of Liége. It is celebrated for its manufacture of broadcloth, which is the staple of the town. There are also cotton, leather and other manufactures. Pop. (1906) 49,124.

**Very, Jones,** an American poet; born in Salem, Mass., Aug. 28, 1813; published some essays and poems in 1839, and was a contributor to the "Christian Register," a monthly religious magazine, and other journals. A complete edition of his "Essays and Poems," with a biographical note of the author, was published by James Freeman Clarke, Boston, 1886. He died in Salem, May 8, 1880.

JONES VERY.

**Very, Lyda Louisa Anna,** an American author; born in Salem, Mass., Nov. 2, 1823; received a classical education; was a public and private teacher for 34 years. She was the first to publish a book in the United States shaped in other than rectangular form. Her booklet "Red Riding Hood" was cut out in the outline form of Red Riding Hood. Her other publications include "Poems and Prose Writings"; "Sayings and Doings Among Insects and Flowers"; "Sylph, the Organ-Grinder's Daughter"; "A Strange Disclosure"; "An Old-Fashioned Garden"; and "A Strange Recluse." She died in Salem, Mass., Sept. 10, 1901.

**Vesalius, Andreas,** a Belgian anatomist; father of modern anatomy; born in Brussels, Belgium, Dec. 31, 1514. In 1544 he was appointed chief physician to the Emperor Charles V., and on his abdication in 1555 he was nominated to the same office by his son, Philip II. His opposition to the Galenic doctrines, his habit of dissecting human bodies, then considered impious, and the great reputation he enjoyed at the Spanish court, raised him many enemies; and a rumor that he had opened the body of a young Spanish nobleman whose heart showed symptoms of vitality, having got abroad, he was publicly accused of murder. The charge was taken up by the clergy and the medical faculty, to whom he was obnoxious, and also by the relations of the deceased; and though he enjoyed the protection of the king, he was obliged to flee from the persecution by which he was assailed, and to travel into Palestine by way of expiation of his alleged guilt. On his return he was shipwrecked on the island of Zante, where he perished miserably of cold and hunger, Oct. 15, 1564. He was the author of numerous works, but that by which he is best known is entitled "The Structure of the Human Body."

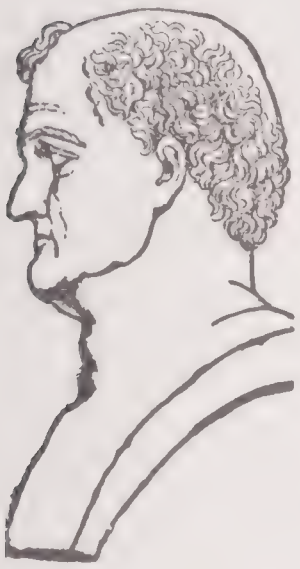
**Vesiculosa,** in entomology, a tribe of diptera, created by Latreille. It was equivalent to Leach's family *Acroceridæ*. There are two genera, *Acrocera* (= *Syrphus*, in part) and *Henops* (= *Ogcodes*), both composed of small insects, having the abdomen much swollen. Species few in number, chiefly exotic; found on plants and among flowers.

**Vesicula,** an order of cutaneous diseases, characterized by the occurrence of vesicles. These may be globular, umbilicated, or acuminated. They arise on any part of the body, and resemble drops of water on the spots where they exist. The fluid in them may be absorbed, or it becomes effused, causing excoriation and small thin incrustations. The order contains three diseases: sudamina, herpes, and eczema.

**Vespariæ,** or **Vespidæ,** the wasps, a family of eculeated hymenopterous insects characterized by their geniculate antennæ, composed in the males of 13 joints, and sometimes in this sex hooked at the extremity. Mandibles strong and dentated; clypeus large; ligula plumose or bilobed.

The stings of the females and neuters are long, powerful, and highly venomous. The larvæ of the wasp tribe are vermiform and without feet. The genus *Polistes* contains wasps which build an open nest of comparatively few cells arranged in one tier, and attached by a short pedicel. The genera *Odynerus* and *Eumenes* comprise the solitary wasps or sand wasps, which build nests of sand in which the mother deposits, at the same time with the egg, the bodies of insects, killed for the purpose, on which the larva feeds.

**Vespasian, Titus Flavius Vespasianus,** a Roman emperor; born of a poor family in the country of the Sabines A. D. 9. He served in the Roman armies, gradually rising to distinction, and in 66 was charged by Nero with the conduct of the Jewish war. He was still engaged in it when Nero died, and while the civil war was going on between Otho and Vitellius, Vespasian was proclaimed emperor, A. D. 69. He returned to Italy, leaving the war to his son Titus, and applied himself to the reëstablishment of order, and the improvement of the administration. He contented himself with the outward life of a private citizen, and contributed the force of his own example toward the introduction of a simpler mode of life, and purer morals. The Jewish war ended in 70, and the next year Vespasian and Titus had a joint triumph. Vespasian died, A. D. 79, leaving two sons, Titus and Domitianus, who both became emperors.



TITUS VESPASIAN.

COIN OF VESPASIAN.

**Vespers,** so called from Vesper, the evening star, was also called *hora lucerna* "lamp hour"). Originally, like that of all the canonical hours, of which at first it was the last, the service consisted of the singing of three psalms intermixed with some prayers. According to the account of all the services given in the Apostolic Constitutions, that for vespers opened with the 140th (141st) Psalm, which was followed by a prayer. A collect was next said by the bishop, and a benediction pronounced on the people, who were then dismissed. But different churches had different usages, and in some, lessons were read, hymns sung, and other prayers offered.



**Vespertilio,** in zoölogy, the type genus of *Vespertiliones*, with 43 species, ranging over the temperate and tropical regions of both hemispheres. Muzzle long; glandular prominences between the eyes small; nostrils opening by simple crescentic apertures; crown of the head vaulted; ears separate, oval, generally equaling and often exceeding the length of the head; tragus long, generally acute, and attenuated upward; tail less than length of head and body; face hairy. Most of the species appear to live in woods; some, either habitually or occasionally, live in caves or under the roofs of houses. The position of attachment of the wings to the hinder extremities and the size of the foot appear to be connected with the nature of their dwellings; those which live in caves have larger feet, more or less free from the wing-membrane, while those living in woods have much smaller feet, enclosed in the wing-membrane to the base of the toes. *V. parisiensis* appears in the Upper Eocene of Montmartre.

**Vespertiliones,** in zoölogy, a group of *Vespertilionidæ*, with eight genera, having the range of the family. Nostrils simple, opening by crescentic or circular apertures at the extremity of the muzzle; ears generally moderate; forehead not grooved.

**Vespertilionidæ,** in zoölogy, a family of *Microchiroptera*, with three groups (plecoti, vespertiliones, and minioptera), generally distributed throughout the temperate and tropical regions of both hemispheres. They are easily distinguished from all other bats by their simple nostrils at the extremity of the conical, somewhat elongated muzzle, by the long tail produced to the hinder margin of the large interfemoral membrane, and by the upper incisor teeth, which are separated by a wide space, and placed near the canines. The eyes are minute, and the inner margins of the ears arise from the sides of the head, not from the forehead.

**Vesperugo,** in zoölogy, a genus of *Vespertiliones*, with 22 species, universally distributed, but more common in the temperate and subtropical regions of the Eastern Hemisphere. This genus has also the extreme N. range of the Chiroptera, one species — *V. borealis* — having been found close to the limits of the Arctic Circle. The bats of this genus are the common bats of all countries, and may be easily known by their comparatively thick bodies, flat, broad heads, and obtuse muzzles (the

thickness of which is increased in front by the rounded glandular elevations), short, broad, and triangular obtusely-pointed ears, obtuse and slightly incurved tragus, short legs, and by the presence in most species of a well-developed post-calcaneal lobule, which probably acts as a kind of adhesive disk in securing the animal's grasp when climbing over smooth surfaces.

**Vespucci, Amerigo,** or **Americus Vespucius,** an Italian navigator, eponymus of the New World; born in Florence, Italy, March 9, 1451. The question of the date of his voyage has been disputed for centuries. According to one account he reached South America in June, 1497, or 14 months earlier than its discovery by Columbus.

AMERIGO VESPUCCI.

His "Letters" (1502), giving an account of his voyages, especially of the voyage of 1501, were translated into Latin, Italian, French, and German, and were widely circulated. He wrote a diary called "The Four Journals," after his fourth voyage. The suggestion to name the newly discovered continent "America" was first offered by Martin Waldseemüller of St. Dié in Lorraine, in his work "Introduction to Cosmography" (1507). He died at Seville, Spain, Feb. 22, 1512.

**Vest, George Graham,** an American lawyer; born in Frankfort, Ky., Dec. 6, 1830; was graduated at Center College, Ky., in 1848, and at the Law Department of Transylvania University, Ky., in 1853; settled in Missouri in the latter year and there began the practice of law; was a member of the Confederate Congress for three years; and of the United States Senate in 1879-1903. He died Aug. 9, 1904.



**Vesta,** an ancient goddess, called Hestia by the Greeks. According to the traditions of that people she was a virgin divinity, and watched over the fire that burned on the household hearth, which was looked on as her shrine. Something sacred attached to this part of the house. It was the family altar; here suppliants took refuge; on it oaths were sworn. Each town had its public fire, which was left continually burning in the Prytaneum; and when a band of colonists went forth from the city, they carried fire lighted at the common hearth with them. At Rome it was believed that Æneas had brought in this manner the sacred fire from Troy. It was preserved in a temple of circular shape with vaulted roof, which stood on the Forum. The sacred fire therein was tended by six priestesses who were called Vestales. They were virgins like the goddess whom they served. They performed several important functions in the State religion of Rome. They assisted at all great public rites, and were present at such religious transactions as the consecration of temples. Their fixed term of service was 30 years, of which they passed 10 in a state of novitiate, 10 in performing the sacred duties of their office, and 10 in instructing novices. After this they were permitted to return to ordinary life if they pleased, though this was a privilege of which few availed themselves; for notwithstanding the drawbacks and restrictions of their position, it was one of great honor and even profit. Lictors preceded them when they appeared in public; consuls and prætors saluted and made way for them. They were maintained at the public expense, and they occupied special places of honor at the public games. If any proved unfaithful to her vows, she met with a terrible fate. She was degraded and deprived of her insignia of office. She was then dressed like a corpse, placed in a close litter, and conducted with all the usual ceremonies attendant on a funeral to a piece of ground called the Campus Sceleratus, where she was buried alive. If the sacred fire of the goddess was allowed through negligence to go out, it was rekindled by the Pontifex Maximus by the friction of two pieces of wood against each other. The festival of Vesta was celebrated on June 9, in each year, on June 15 the

A VESTAL VIRGIN.

temple was cleaned and purified, and on March 1, the sacred fire and the laurel tree that shaded it were renewed.

**Vesta,** in astronomy, the name of the fourth asteroid, discovered by Olbers at Bremen, March 29, 1807, his second and last discovery among the asteroids. It is the brightest among the small planets, sometimes being visible to the naked eye. After its discovery no more were found till the discovery of Astræa in 1845, more than 38 years later.

**Vestibule Trains,** railroad cars provided with inclosed and connected platforms. The expedient of inclosing, or, as it has been termed, the vestibuling of, car platforms for the comfort and convenience of passengers having occasion to pass from car to car while a train is in motion, has been in daily use for some years. From ordinary vestibules constructed with board partitions and without ornamentation — such as are found on the fast mail trains — to the glass-paneled, tight-fitting, and handsomely decorated vestibules designed for magnificently appointed passenger trains, was an easy and natural transition. The wonder is that the application of the vestibule arrangement to passenger trains was so long delayed. When so introduced the device could hardly be called a new invention. The vestibules are not merely covered passageways between the cars of which the train is made up, though that in itself is an inestimable boon. They are practically flexible and continuous buffers, extending from floor to roof, coming into frictional contact when the coaches are coupled together, and thus forming the separate cars into one. By means of this arrangement vestibule trains are really hotels on wheels, there being no more trouble in passing from one car to another than in going into adjoining rooms in one's own home. The trains possess the advantage of having dining room, library, bath room, trunk room, and bed chambers all on one floor. Sheets of rubber and handsome draperies cover the lines of junction of the vestibules, while the floors are carpeted the same as the main body of the coaches, thus giving the effect of a passageway between two large and tastefully furnished rooms.

**Vestige,** the mark of a foot made in passing; a footstep, a footprint, a track, a trace; hence, a mark, sign, trace, or impression of something no longer present or existing; a sensible evidence or sign of something absent; lost, or gone; remains.

Also a familiar term in biology, derived as shown in the quotation:

"Anatomists who are careful in the use of terms, and yet have had to content themselves with using one and the same word, rudiment, for disappearing and for imperfected structures, will welcome a suggestion recently made by J. A. Ryder (Proc. U. S. Nat. Mus., 1886, p. 80). He writes: 'Structures which are disappearing should be called vestiges. Structures which are still imperfect, but are appearing, ought to be called rudiments. As it is, the word rudiment is usually misapplied so far as concerns its literal sense when speaking of rudimentary organs.'"— "Athenæum," Oct. 16, 1886.

**Vestments, Sacred.** The use by the priesthood of a distinctive costume in public worship formed a part not only of the Jewish, but of almost all the ancient religions. Generally speaking, in the Christian church the sacred vestments represent the original costume of Rome and the East in the first centuries, retained unaltered by the clergy, whereas in the everyday world the costume varied in fashion, in material, in color from year to year. There seems little room for doubting that from a very early time Christian ministers employed some distinctive dress in public worship; and Catholic writers even find traces in the beginning of the 5th century of the practice of blessing the vestments which were destined for the public services of the Church. The vestments used in the celebration of mass by priests of the Roman Catholic Church are the amice (originally worn over the head); the alb; the girdle, a linen cord tied round the waist, and confining the folds of the alb; the maniple, a narrow strip of embroidered silk, worn pendent from the arm; the stole, and the chasuble. The three last named are always of the same material and color; but this color, which appears primitively to have been in all cases white, now, and for many centuries, varies according to seasons and festivals, five different colors being employed in the cycle of ecclesiastical services — viz., white, red, green, violet, and black. Cloth of gold, however, may be substituted for any of these, except the last. Bishops, in celebrating, wear, besides the vestments of priests, two inner vestments, the dalmatic and tunic (those of the deacon and sub-deacon respectively), as also embroidered gloves and shoes, or buskins, together with the distinctive episcopal ornaments — the pectoral cross, ring, miter, and pastoral staff, or, if archbishops, the crozier. Archbishops celebrating mass also wear the pallium. Bishops, when they celebrate pontifically, take their vestments from the altar, whereas priests put them on in the sacristy; but this is a late distinction. In other public services priests and bishops wear the cope, with a pendent cape or hood. In the ministration of the other sacraments, and also in administering communion privately, priests wear the surplice with the stole, or it may even be the stole alone. In the Greek Church the *stoicharion*, *zoné*, *epitrachelion*, *epimanikia* (a square piece of cloth, stiffened, worn

pendent from the girdle, and perhaps originally a napkin), and ample *phelonion* correspond respectively with the alb, girdle, stole, maniple, and chasuble. Greek bishops wear the *omophorion*, which corresponds with the later pallium, and also a pectoral cross, and carry a short pastoral staff; but they wear no ring, and, except by the patriarch of Alexandria, the miter is not worn in the sanctuary.

The natural effect of the religious changes of the 16th century was to put aside the costume at the same time and on the same grounds with the ceremonies of the existing worship. This was done, however, by the different churches of the Reformers in very various degrees. The Calvinistic worship may be said to have dispensed with vestments altogether. With the cassock, the Lutherans generally retained the alb, and in some countries the chasuble. In the Swedish Church full vestments are retained. In the English Church a variety of practice has existed. As to the rest of the costume, the first Prayer-book retained the Roman vestments with little change; and as the vestments and ornaments of 1549 were again enjoined in 1559, a so-called ritualistic movement in the English Church has since 1851 reintroduced in some places almost every detail of the Roman costume in the communion and other services, a revival which has in many instances been vigorously resisted.

**Vestris, Lucia Elizabeth,** an English actress; the granddaughter of Bartolozzi, the engraver; born in London, January, 1797. Accomplished in music, French, and Italian, she married at 16 Armand Vestris, ballet-dancer, member of a family originally Florentine that gave to France a series of distinguished cooks, actors, and ballet-dancers. Three years later she separated from her husband and went on the stage in Paris (1815), attaining fair success. In 1820 she appeared at Drury Lane, London, soon became famous in "The Haunted Tower," was even more popular as Phœbe in "Paul Pry," and in light comedy and burlesque was uniformly successful. She was lessee of the Olympic when in 1838 she married Charles James Mathews, and she afterward undertook the management of Covent Garden and the Lyceum. She retired in 1854, and died in Gore Lodge, Fulham, England, Aug. 8, 1856.

**Vestry,** a room adjoining a church, where the vestments of the clergy are kept. Hence the place of meeting of those having the charge of parochial affairs, and collectively the persons themselves to whom these affairs are intrusted. In England, the minister, church-wardens, and chief men of a parish generally constitute a vestry, and the minister, whether rector, vicar, or perpetual curate, is ex-officio chairman. The powers of the vestry include the expenditure of the parish funds, the repairing or alteration of churches or chapels, and the appointment of certain parish officers. In London the vestries are highly important bodies. In the Protestant Episcopal Church in the United States a committee is chosen annually by the parish, who, in conjunction with the church-wardens, manage its temporal concerns.

**Vesunna.** See PÉRIGUEUX.

**Vesuvianite.** See IDOCRASE.

**Vesuvius,** a volcanic mountain of southern Italy, situated about 10 miles E.S.E. of Naples on the E. shore of the bay; the only active volcano on the continent of Europe and the most celebrated in the world. It rises abruptly and isolated from the Campanian plain, having a nearly circular base of about 8 miles in diameter and 30 in circumference, and being crowned by two summits. Of these the loftier is the conical peak of Vesuvius, which previous to the eruptions of 1906 was placed at 4,200 feet, but was diminished at that time by about 270 feet, and through eruptive disturbances is constantly liable to change. On the N. and E. Vesuvius proper is enclosed by the precipitous semicircular ridge of Monte Somma, 3,730 feet, which constitutes the remains of the crater destroyed in the great eruption of A. D. 79. Between these summits is a deep valley, the Atrio del Cavallo. Monte Somma was the seat of volcanic activity long before Vesuvius, which first (A. D. 63) became convulsed by earthquakes, repeated at intervals till 79, in which year occurred its earliest known eruption. This was followed by others, of which the more memorable are that in 472, when its ashes alighted in Constantinople; in 512, when they were wafted to Tripoli; in 1036; and in 1500; after which ensued a period of inaction, broken in December, 1631, by a destructive outbreak which denuded the mountain of the forest growth with which it had become clothed. The 18th century witnessed many of its eruptions, the most remarkable being that of 1794, when a lava stream swept over the village of Torre del Greco and penetrated the sea to a distance of 362 feet, by which time it was 1,127 feet wide and 15 feet high. This stream was so liquid that to leave the crater and enter the sea—a journey of 12,961 feet—took only six hours. Another memorable outbreak was that of 1822, when the so-called "smoke" from the crater rose to four or five times the height of the mountain, emitting quantities of ashes and large lava-masses, and pouring down torrents of rain. In 1855 occurred a terrible eruption, in which a fissure on the N. slope of the great cone discharged a lava stream which ravaged the fertile and highly-cultivated region below. Another visitation began at the end of January,

1871, developed great violence on April 26, 1872, and subsided by May 1. San Sebastiano and Massa were greatly damaged, the cone threw up fragments of rock to a height of over 4,000 feet, and the detonations were very severe.

In April, 1906, occurred a series of eruptions which equalled in intensity those of 1631 and 1872. From the first of the year the mountain had displayed an unusual activity, which by April 5 assumed violent proportions. On April 7 the town of Boscotrecase was partly destroyed by a stream of lava that burst from the southern slope on the 6th. There were other streams of minor importance, but the total quantity of lava set free was comparatively small. The summit-crater, though there was no outbreak of lava from it, hurled forth vast quantities of ashes, lapilli, and larger fragments, which were the characteristic feature of the general eruption and made it very similar to that of A. D. 79. At the N. E., Ottajano and San Giuseppe were largely destroyed, Terzigno, Somma, and other adjacent communes seriously damaged, by these volcanic showers. At the W. and N. W., ashes and fine lapilli were deposited, especially in Torre del Greco and Portici but also in Naples and its environs. Vineyards on the slopes and fertile farming districts at the base were covered with erupted material from a few inches to more than a yard in depth. Railway traffic was seriously obstructed and the terror-stricken peasantry fled in large numbers to Naples. The loss of life, estimated at about 500, was caused mainly by the collapse of buildings under the weight of accumulations upon the roofs. The immediate damage to property was placed at about $10,000,000. By April 23 the volcano had resumed its normal condition. Throughout these disturbances the usual earthquake shocks were frequent and the electric phenomena uncommonly extensive.

From the observations of many years the following characteristics of the volcanic activity of Vesuvius have been summarized by Professor Palmieri: (1) The filling up of the crater portends an imminent eruption, and its full discharge is followed by a period of repose. (2) The narrowing of the mouth of the crater by accumulated débris impedes the flow of the lava, and this impediment leads to the outburst of lateral openings which from their greater proximity to the source of heat emit the lava in a more liquid condition, whereby its flow becomes that of a continuous stream. (3) When the internal channel is blocked by solid débris, the effort of the elastic vapor to clear it is supposed to cause the earthquakes by which the greater eruptions are preceded and accompanied. (4) What is called "smoke" from the crater is simply steam more or less blackened with incinerated dust. When this dust is in excess it accelerates the fall of the steam, which, having become water by condensation, descends like a mud torrent, flooding the ground. This was a notable feature of the visitation in which Pompeii perished. (5) During an eruption what appears as flame shooting out of the crater is really the reflection of the molten lava within the crater on the steam and upon the ashes suspended in the steam accumulated above it. (6) The rapid condensing of vapor into water, and the conversion of this into steam, generates electricity, which explains the lightning-effects visible on the edges of the clouds overhanging the crater.

Vesuvius is reckoned by geologists the most instructive object lesson on volcanoes in general, and the University of Naples, by an admirable assortment of specimens of its structure, has greatly facilitated its study. Professor Sacchi numbers 40 species of minerals found in it, of which augite, hornblende, mica, sodalite, breislakite, magnetic iron, and leucite are the most abundant. The fertility of its slopes, since Martial's famous epigram on the destruction of Pompeii, has passed into a proverb, its chief product being the wine called Lacrima Christi. Its observatory (1844) has acquired a European reputation from the meteorologist Melloni (*q. v.*); still more from his successor, Professor Palmieri (*q. v.*), who directed it with equal sagacity, skill, and daring from 1854 till his death in 1896; and from Prof. V. R. Matteucci (*q. v.*), who with his assistant, F. A. Perret, an American, remained at his post during the eruptions of 1906, and made valuable scientific observations, though the recording machinery of the seismic apparatus was inadequate to the heavy earthquake shocks and was seriously interfered with by the remarkable electric phenomena. Vesuvius may be ascended by rail to within a short distance of the crater. See HERCULANEUM; POMPEII; VOLCANOES.

**Vesuvius, The.** See DYNAMITE CRUISER.

**Veszprém,** or **Veszprim** (Ger. *Weissbrunn*), city of Hungary, capital of the county (comitat) of that name. It is the seat of a bishopric and contains a fine mediæval cathedral, and a Piarist college and other educational institutions. There are iron-works, spinning and weaving industries, and a trade in grain, wine, and garden produce. Built on and about a steep hill, Veszprém was once a strong fortress. During the 16th century it was an object of bitter contest between Turkey and Hungary, and from 1605 to 1683 was held by the former. Pop. (1900), 14,114.

**Vetancurt, Augustin de,** a Mexican historian, born in the City of Mexico, 1620. He was a member of the Franciscan order, in which he became connected with the provincial chapter. At the time of his death

he was commisario-general of the Indies. He was especially noted as an Aztec scholar, and in his chief work, "Teatro Mexicano," he left a historical and ethnographic description of New Spain. This treatise is an important contribution to the knowledge and literature of the American continent.

**Vetch, Fetch, Fitch,** or **Tare,** terms variously used to indicate the fodder plant, *Vicia sativa* and the genus *Vicia.* This genus, belonging to the *Papilionaceæ* suborder of *Leguminosæ,* consists of about 100 species of climbing or diffuse herbs, distributed through temperate regions of the Northern Hemisphere and South America. The common bean is frequently classed under *Vicia* as *V. faba.* The next most important species is the vetch, or tare of agriculturists—the *V. sativa* above mentioned. It is one of the best fodder plants, but is only of one or two years' duration; it is important also for green manure, and as a companion crop with clovers. The practice of sowing it along with oats or barley is strongly recommended, insuring a greater bulk of produce, and preventing the crop from massing and rotting in wet weather. *V. Cracca,* or the tufted vetch, *V. peregrina, V. sepium, V. sylvatica,* and various species of the same group as *V. sativa,* are all relished by cattle, and some of them are cultivated in Southern Europe. Twelve species of *Vicia* (including therein *Ervum*) are natives of Great Britain.

**Veterinary Art,** the art which deals with the nature, causes, and treatment of the disorders of domestic animals. The first veterinary school was instituted in 1762 at Lyons; in 1766 that at Alfort near Paris was opened. A similar institution was established at London in 1791, and in the year following one in Berlin. In Edinburgh instruction in veterinary medicine began to be given by Mr. Dick in 1819, and in veterinary surgery in 1823. He erected college buildings soon after, collected a museum, and at his death in 1866, left all his fortune to the endowment of this institution. There is also another veterinary school in Edinburgh, and one in Glasgow. In London, besides the older institution now called the Royal Veterinary College, Camden Town, there is a second established at Bayswater in 1865. In 1844 the veterinary surgeons obtained a charter constituting them a corporation under the title of the Royal College of Veterinary Surgeons, and empowering them to appoint examiners and grant licenses or diplomas, the holders of which are members of this body (M. R. C. V. S.). There is a board of examiners for Scotland. In the army a veterinary surgeon is an officer ranking on admission with a lieutenant, and after a sufficient length of service with a major. In the United States veterinary chairs have been added to some of the universities, but most of the schools are private institutions. In 1900 there were 13 schools, and 316 students.

**Veterinary Medicine,** that branch of medical science which embraces the treatment of diseased domestic animals, and the preservation of their health. It has evidently been practised from the earliest times; and there is every reason to suppose that the study of disease in the inferior animals was applied, on comparative principles, to the treatment of disease in the human subject. For many centuries, the inferior animals alone were used for purposes of scientific dissection. Among the Greeks, the study of the diseases of domestic animals, and of the remedial agents applicable to such diseases, was directly applied to the practice of medicine, and it was compulsory on any one making a new discovery regarding such curative agents, to divulge it for the public good. Physicians were presumed to be acquainted with veterinary medicine, and Hippocrates, the most celebrated physician of early times, wrote a treatise on the curative treatment of horses. Columella and Vegetius, Latin authors, the latter of whom flourished about A. D. 300, wrote books on the subject, which contain an epitome of the best of all that was previously known. In the Middle Ages, however, veterinary medicine was utterly neglected, and desolating plagues swept away nearly the entire herds and flocks of the countries they visited, precisely as the great epidemics of the Middle Ages swept away vast numbers of human beings, almost depopulating many of the provinces of Europe. Indeed, cattle plagues were not infrequently the forerunners of great epidemics, and though they may have had no connection as cause and effect, they may have had some co-relation, as effecting the food supplies of human beings and ushering in periods of famine, which would give intensity to epidemic diseases.

During the 16th century veterinary medicine became again a subject of study, and the Constantine collection of works were translated from the original Greek into Latin by the order of François I., and from the Latin they were soon afterward translated into Italian, French and German. During the 17th century, the more important works which appeared were Fiarchi's Italian treatise on "Horsemanship," and the "Infermita e Suoi Remedii, del Signor Carlo Ruini," published in Venice, in 1618. In 1654 the "Grand Marêschal François" was published; and, toward the close of the century, the elaborate work of

Sollysel. In Great Britain, Blundeville and Gervase Markham published works on farriery; and Snape, farrier to Charles II., published an anatomical treatise on the horse, his plates being copied from those of Ruini. The 18th century produced numerous authors on veterinary medicine, more especially in France, an impetus having been given to the study by the establishment in 1761, under royal patronage, of the Veterinary Seminary at Lyon under Professor Bourgelat. In 1766 another school was opened at Alfort, near Charenton; and others were subsequently opened at Strassburg and Montpelier, and in almost every European city of note, as Vienna, Dresden, Leipsic, Berlin, Copenhagen, Prague, Munich, Hanover, Naples, London, etc. In 1754 La Fosse, a contemporary of Bourgelat, published his numerous memoirs in one volume, which was soon afterward translated into most of the European languages.

The most celebrated French writers of the beginning of the 19th century were Chabert, Flandrin, Gilbert, Vicq-d'-Azyr, and Huzard. In the reign of George I., Sollysel's work was translated from the French into English by Sir William Hope; and about the middle of the 18th century, Gibson, who was formerly surgeon to a regiment of cavalry, published his treatise on farriery, the best which had then appeared in the English language. The other writers of this period are Bracken, Bartlet, and Osmer, who had been educated as medical practitioners.

In 1791 the Veterinary College of London was instituted under the presidency of the Duke of Northumberland. In Queen Victoria's reign a charter was granted to the veterinary body at large, forming a Royal College of Veterinary Surgeons, empowered to examine candidates and grant diplomas. In 1819 the first course of lectures on the subject in Scotland was delivered by Mr. Dick, and a systematic course under the auspices of the Highland and Agricultural Society and the Senatus Academicus of Edinburgh in 1823. At his death, in 1866, Mr. Dick bequeathed to the city of Edinburgh his entire fortune, to be devoted to the teaching and improvement of veterinary medicine. In 1857 Mr. John Gamgee established a new veterinary college in Edinburgh; and since 1861 a veterinary school has been conducted in Glasgow by James Macall. In the United States there were 13 schools of veterinary medicine in 1902. Nearly all connected with well-known colleges and universities.

**Vetiver,** the dried roots of the cuscus grass, an Indian andropogon, which has a very agreeable and persistent odor, something like sandalwood. Baskets, fans, and mats are made of it.

**Veto,** the power which one branch of the Legislature of a State has to negative the resolutions of another branch; or the right of the executive branch of government, such as king, president, or governor, to reject the bills, measures, or resolutions proposed by the Legislature. In Great Britain the power of the crown is confined to a veto, a right of rejecting and not resolving, and even this right is rarely exercised, the last occasion being in 1707.

In the United States the President may veto all measures passed by Congress, but after that right has been exercised the rejected bill may become law by being passed by two-thirds of each of the Houses of Congress. If the President fails to return the bill in 10 days, Sundays excepted, it becomes a law as if he had signed it. If, however, Congress adjourns within 10 days after the passage of a bill and the President has refrained from acting on the bill, it does not become a law; the disposal of a bill in this way, when the President does not choose to veto it formally, is termed a "pocket veto." The earlier Presidents seldom exercised the veto power. Up to Jackson's administration it had been used but nine times — twice by Washington, six times by Madison and once by Monroe. Jackson vetoed nine bills. Up to Johnson s administration no bill had been passed over a veto; but then a large majority in each House was opposed to the President's policy, and the bills which he vetoed were usually re-passed by the necessary two-thirds vote and became laws in spite of him. President Hayes sent to Congress a large number of vetoes, including those of a bill to restrict Chinese immigration and several appropriation bills with riders attached. President Cleveland vetoed a larger number of bills than all the previous Presidents collectively, but the greater number of these were private pension bills.

**Veto Act,** in the Scotch Church, an act of the General Assembly passed on May 27, 1834, by 184 to 138 votes. It provided that when a patron issued a presentation to a parish in favor of a minister or probationer, the disapproval of the presentee by a majority of male heads of families being communicants, should be deemed sufficient ground for his rejection, it being enacted that no objection should be valid unless the person making it was prepared to state before the Presbytery that he was not actuated by factious or malicious motives, but solely by a conscientious regard to the spiritual interests of himself or the congregation. The passing of this act was one of the causes of the disruption.

**Veuillot, Louis** (vuh-yō′), a French journalist; born in Boynes, (Loiret), Oct. 11, 1813. His works include: "Pilgrimages in Switzerland" (1839); "Rome and Loretto" (1841); "The Virtuous Woman" (1844); "The French in Algeria" (1845); "Free-Thinkers" (1848); "Vindex the Slave" (1849); "The Day after the Victory" (1850); "The Droit du Seigneur in the Middle Ages" (1854); "The Perfume of Rome" (1861); "The Odors of Paris" (1866); "Paris during the Two Sieges" (1871; "Molière and Bourdaloue" (1877); "Poetic Works" (1878); etc. He died in Paris, April 7, 1883.

LOUIS VEUILLOT.

**Vevay,** or **Vevey,** a Swiss town in the canton of Vaud; a favorite health resort; remarkable for the beauty of its situation on the N. shore of the Lake of Geneva; 11 miles E. of Lausanne. It stands at the mouth of the gorge of the Veveyse. From the elevations about the town the fine view to the E. commands the valley of the Rhone, backed by the magnificent ramparts of the Alps of Valais. In the Church of St. Martin (date 1498) Ludlow, one of Charles I.'s judges, and Broughton, who read to him his sentence of death, are buried. There is some trade in milk, cheese, and wine; and Vevay cigars are largely made and exported. Pop. (1900) 11,915.

**Vexillum,** in Roman antiquities: (1) The standard of the cavalry, consisting of a square piece of cloth expanded upon a cross, and perhaps surmounted by some figure. (2) The troops serving under one vexillum; a company, a troop. In ecclesiastical affairs: (1) A processional cross. (2) A strip of silk or linen attached to the upper part of a crozier, and folded round the staff to prevent the metal being stained by the moisture of the hand. In ornithology, the rachis and web of a feather taken together; the whole of a feather, except the calamus or quill.

**Vézelay,** a small town in the French department of Yonne; 5 miles S. E. of Auxerre. Its ancient and curious abbey church was restored by Viollet-le-Duc in 1868. Hither Becket retired in 1168; here St. Bernard preached the Crusade in 1145; and on the plain below Richard Cœur de Lion and Philip Augustus joined their forces in 1190 for the third crusade. Beza was a native.

**Via Dolorosa,** "Way of Pain," the road leading from the Mount of Olives to Golgotha, which our Lord traversed on His way to His crucifixion. It is about a mile in length.

**Viaduct,** a term applied to extended constructions of arches or other artificial works to support a roadway, and thus distinguished from aqueducts, which are similar constructions to support waterways. This term became familiar during the 19th century, in consequence of the great number of vast structures so designated which were erected in various parts of the civilized world for the purpose of carrying railways or roadways over valleys and districts of low levels, or above surface roads, and the general name of viaduct is now recognized as applicable to all elevated roadways for which artificial constructions of timber, iron, bricks, or stonework are established; and accordingly among the principal railway works are to be enumerated viaducts of all these materials.

**Viaduct Over Des Moines River.** There was recently completed across the Des Moines river in Iowa the longest railway viaduct for its height in existence. While there are other viaducts of considerably greater height, what makes the Boone viaduct, as it is called locally, remarkable, is the combination of height and length, and the fact of its being a double-track structure. In point of total weight of metal employed in its construction it is fully three times as heavy as the next largest bridge of the kind in the world.

| | Kinzua. | Loa. | Pecos | Des Moines. |
|---|---|---|---|---|
| Length ..... | 2,050 | 800 | 2,180 | 2,685 |
| Height above water.. | 302 | 336 | 321 | 185 |
| Greatest width at base | 103 | 124 | 90 | 70 |
| Width at grade..... | 18 | 13 | 16 | 27 |
| Number of tracks... | 1 | 1 | 1 | 2 |
| Tons of metal..... | 1,400 | 1,115 | 1,820 | 5,680 |

The loftiest of these structures is on the line of the Antofagasta railway in Bolivia and is known as the Loa viaduct. It was constructed by English engineers in the year 1889. The height of the tracks above the water is 336 feet. As the crossing is over a narrow cañon, the length is only 800 feet; the great depth, however, involves a proportionate width of the towers at the base, the extreme spread of the columns being 124 feet. The next in point of height is the Pecos viaduct, which carries the Southern Pacific railway over the Pecos river in Texas. This structure, which was built in 1892, is but little lower than the Bolivia viaduct, the height from water to rail being 321 feet, and the total length from abutment to abutment is 2,180 feet. Then comes the Kinzua viaduct, 302 feet above the water and 2,050 feet in length.

These three viaducts carry only a single track; and, as we have said, it is the width and consequent weight of the floor system, and the great breadth of the whole structure, which render the Des Moines viaduct so much larger than the other three, the total weight of steel in the structure being 5,680 tons, as against 1,820 tons in the Pecos, 1,460 tons in the old Kinzua viaduct, and 1,115 tons for the Loa viaduct.

The Des Moines structure consists of the viaduct proper, built of plate-girder spans carried on braced towers, and a 300-foot truss across the channel of the river. The towers consist of four legs of built-up latticed construction, with strong lateral and longitudinal bracing between them. The spans across the towers are 45 feet in length and the spans between the towers are 75 feet. The substructure was built in the ordinary method, by means of derricks which were carried by the towers as they were built up section by section to the level of the under side of the plate-girder superstructure. It should be explained that the much greater weight of the Des Moines viaduct as compared with the others mentioned in our comparison is to be attributed not merely to the fact that it carries two tracks but also to the extraordinary increase which has taken place of late years in the weight both of locomotives and rolling stock. The single-track viaducts were constructed at a time when the maximum load on the axles of rolling stock was very much lighter than it is today. A striking instance of the increase in weight of bridges, due to this, is shown in the comparison of the new Kinzua viaduct with the old one, the weight of the metal in the new structure having been increased 40 per cent. to meet the heavier rolling stock of the present day.

**Viaduct, the New Riverside, New York.** There was completed in 1901 one of the most important of the public works which are being carried out for the purpose of providing New York city with a complete system of suburban boulevards and driveways. The work in question is the massive viaduct which for three years was under construction across Manhattan valley. It was built for the purpose of connecting Riverside Drive with the system of driveways which embraces the N. end of Manhattan Island. Now that it is completed, there exists a continuous high-level boulevard from 72d street and Hudson river to the W. end of Dykeman street on the Harlem river, a distance of 7¼ miles. Dykeman street forms practically a continuation of the Harlem Speedway; and as the latter is between 2 and 3 miles in length, the completion of the Riverside viaduct opens up to the people of New York a continuous drive of 10 miles along the banks of the Hudson and Harlem rivers. The new viaduct was built to carry the

Viaduct

Riverside Drive at a high level across Manhattan valley which has here a width of about a third of a mile, and is intersected by six different streets. One of these forms the main approach to Fort Lee ferry, and is so greatly in use by electric trolley lines and general street traffic as to render the construction of a driveway N. across the valley at street grade very undesirable. By the construction of the viaduct, however, connection is made across the valley, free from the inconveniences of the cross-town traffic. Now that the work is completed, it may justly be said that the roadway from 72d street through Riverside Drive over Manhattan valley and by the way of Boulevard Lafayette affords one of the most picturesque and unique drives in any great city of the world.

In designing the viaduct an effort was made to harmonize it in its general appearance with the surrounding country and more prominent local buildings. Its total length, including masonry approaches, is 2,074 feet; its S. approach is just below the historic Villa Claremont, to the S. of which towers the impressive pile of the Grant Memorial Tomb. The S. masonry approach is 262 feet long, and the steel viaduct is 1,564 feet in length. The N. approach faces the Hudson river, the N. end of the viaduct being curved in as it meets the approach. The roadway which is 60 feet in width, stands on an elevation of 75 feet above the street level. On each side of the roadway are 10-foot sidewalks supported on projecting brackets. The S. entrance, as shown in our engraving, is widened out and bounded by a semicircular wall, in the center of which stone staircases lead down to the valley below. The arches of the viaduct are of 65-foot span and are of latticed, plate-girder construction, rectangular in section. The supporting columns measure 3x5 feet in section and are also of latticed, plate-girder construction. The floor is carried on floor-beams, 5 feet in depth, of which there are 6 to each span, and upon these are laid 13 12-inch, I-beam, floor joists. Upon the joists is a solid floor formed of ⅜-inch buckle-plates, which are covered with a paving composition of coal-tar residuum and broken stone, over which is laid a smooth asphalt surface.

Manhattan street is crossed by a large semicircular arch of 130-foot span. It will be noticed that the plating of the columns is carried up, in every case, between the spandrels of the arches to the level of the under side of the longitudinal plate girders which carry the floor system. These plate girders are designed to bear the whole of the dead load of the floor system, and they have been so nicely calculated that in the completed bridge their under side just touches the crown of the arches. Most of

the live load that comes on the bridge, consequently, will be transmitted directly to the arches, and transferred by them to the columns. In the case of the 130-foot span the two longitudinal plate-girders were of massive proportions, being, indeed, two of the largest plate-girders ever constructed. They are each 130 feet long, 10 feet deep, and 3 feet wide, and each weighs 62½ tons.

The work of raising these girders into position was accomplished by means of powerful derricks placed upon the completed structure to the S. and upon a series of special trestle bents to the N. of the crossing. Four hoisting engines were engaged in lifting each span, and the whole work was done with but a few hours' interruption to street traffic.

**Viardot, Louis,** a French historian; born in Dijon, France, July 31, 1800. He wrote: "History of the Arabs and Moors of Spain" (2 vols. 1851); "The Traditional Rise of Modern Painting in Italy" (1840); "The Museum of France" (1855); "Spain and the Fine Arts" (1866). He died in Paris May 5, 1883.

**Vibrissæ,** in biology, hairs or bristles attached to the lips of many mammals, and especially developed in the Carnivora and Rodentia. The vibrissæ are organs of touch, and give warning of external obstacles, and branches of the fifth pair of nerves are distributed to their roots. Cats are rendered unable to catch mice when their whiskers are removed, and various experiments have shown that rabbits, without the assistance of their eyes, can by means of these hairs, find an outlet in narrow passages. They are popularly known as smellers and whiskers. In many birds the nasal apertures are covered with stiff, imperfect feathers (also called bristles), to which the name vibrissæ is sometimes applied. These, however, are not organs of touch, but serve to prevent the nostrils becoming obstructed by dust.

**Vibrios,** a name of certain infusoria or microscopic eels, and now often regarded as bacteria, or of fungoid nature.

**Vibroscope,** an instrument invented by Duhamel for graphically recording the vibrations of a tuning fork, by means of an attached style on a piece of smoked paper gummed around a cylinder. The fork is made to vibrate, and the cylinder turned, the style making a mark whose waves correspond to the number of vibrations in a second.

**Viburnum,** a genus of plants of the natural order *Caprifoliaceæ*, having a five-toothed calyx, a five-lobed, wheel-shaped, bell-shaped, or tubular corolla, five stamens, three sessile stigmas, and a one-seeded berry. The species are shrubs with simple leaves, natives chiefly of the N. parts of the world. *V. opulus* is the guelder rose, or snowball tree, and *V. tinus* is the laurustinus, both well-known ornamental shrubs. *V. lantana*, sometimes called the wayfaring tree, is a native of the warmer temperate parts of Europe and Asia, not infrequent in England, and often planted as an ornamental shrub. It is a large shrub or low tree, with large elliptic serrated leaves, downy star-like hairs on the under side. The young shoots are very downy. The flowers are small and white, in large dense cymes; the berries purplish black, mealy, and mucilaginous, with a peculiar sweetish taste. They are useful in diarrhœa and catarrh, and are used in Switzerland in the manufacture of ink. Bird lime is made from the bark of the roots in the S. of Europe, but is inferior to that made from the bark of the holly. The inner bark is very acrid, and was formerly used as a vesicant. The wood is white and hard, and is prized by turners. Tubes for tobacco pipes are made of the young shoots. Two North American species, *V. edule* and *V. oxycoccus*, nearly allied to the guelder rose, produce berries of an agreeable acid taste, which are used like cranberries.

**Vicar,** in English canon law, the priest of a parish, the predial tithes of which are impropriated or appropriated; that is, belong to a chapter or religious house, or to a layman who receives them and allows the vicar only the smaller tithes or a salary.

**Vicar=Apostolic,** in the Roman Church, a name formerly given to a bishop or archbishop, generally of some remote see, to whom the Pope delegated a portion of his authority, or to any ecclesiastic invested with power to exercise episcopal jurisdiction in some place where the ordinary was for some reason incapable of discharging his duties efficiently. Now vicars-apostolic, who are nearly always titular bishops, are appointed where no episcopate has been established, or where the succession has been interrupted. There are at present a large number of such vicariates in existence.

**Vicar=Forane,** in the Roman Church, a dignitary or parish priest appointed by a bishop to exercise a limited jurisdiction in a particular town or district of his diocese. The chief duty of vicars-forane is to maintain ecclesiastical discipline, report to the bishop on the lives of the clergy, to preside at their local conferences, the care of sick priests, the administration of Church property, and the maintenance of sacred buildings. In Ireland almost their sole function is to grant episcopal dispensations for the non-publication of banns.

**Vicar=General,** in the Roman Church, a clerk, usually (but not necessarily) in holy

orders, and having a degree in canon law, appointed by a bishop to assist in the discharge of episcopal functions. In matters of jurisdiction the vicar-general is regarded as the ordinary, and there is no appeal from the former to the latter; but the vicar-general may not do any of those things which belong to the episcopal order. A bishop is not obliged to appoint a vicar-general, but may appoint two or more if necessary. The office corresponds closely to that of an archdeacon in the early and mediæval Church. In the Anglican Church, an officer employed by the Archbishop of Canterbury and some other bishops to assist in such matters as ecclesiastical causes and visitations.

**Vice=Admiral.** See ADMIRAL: RANK.

**Vice=Chancellor,** an officer next in rank to a chancellor; the deputy of a chancellor.

In English law, a judge in the Chancery division of the High Court of Justice in England, holding a separate court. The office was abolished by the Judicature Act. The first Vice-Chancellor was appointed in 1813; the last holder of the office was Sir James Bacon, who retired Nov. 11, 1886. In Ireland there is a Vice-Chancellor, and the judge of the local Court of Chancery of the Duchy of Lancaster is also styled a Vice-Chancellor. In some of the United States there exists a judicial office analogous to the British institution described above. Where a State has a court of chancery, the highest incumbent is termed chancellor and the next vice-chancellor.

**Vicenza,** a town of North Italy; capital of a province of the same name; 49 miles W. of Venice, on the Bacchiglione, where joined by the Retrone at the foot of some wooded hills. It is well built, containing handsome streets and several elegant squares. The public buildings are almost all the work of Palladio, who was born here, or of scholars who rather slavishly imitated him. The most remarkable edifices are the Duomo or cathedral; the Palazzo della Ragione (town hall), an ancient Gothic building, with fine connected buildings by Palladio; the Museum, one of Palladio's finest buildings; the Palazzo-Prefetizzio, and the theater, both by Palladio; the lyceum, churches, and hospitals. The manufactures are silk, woolen, and linen tissues, leather, earthenware, hats, etc. Vicenza (Vicentia) was founded above a century before the Christian era, and became a Roman municipal town. Pop. (1901) 44,777.

**Vice=President,** one who holds office next to a president. The Vice-President of the United States is the second executive officer of the government, and is elected at the same time and in the same manner as the President. During the life and active health of the President his executive functions are in abeyance, his duties being confined to the presidency of the Senate during the sessions of Congress. In the Senate he has no vote, except in case of a tie between the opposing parties on a division of the House. Then, as is usual with parliamentary presiding officer, he has the casting vote. In the event of the death or incapability of the President, the Vice-President assumes the duties of the office and continues to discharge them (in case of the President's death) till the end of the term for which the two were elected, or (in case of temporary disability) till the disability of the President shall have passed away. Several times in the history of the country has the Vice-President been called to the presidential chair — the first case being that of John Tyler, who succeeded William H. Harrison; then came Millard Fillmore, who succeeded Zachary Taylor; Andrew Johnson, who succeeded Abraham Lincoln; Chester A. Arthur, who succeeded James A. Garfield; and Theodore Roosevelt, who succeeded William McKinley. (See UNITED STATES.) The salary of the Vice-President is $12,000 a year.

**Viceroy,** the governor of a kingdom or country, who rules in the name of the king or queen with regal authority as the king's or queen's substitute.

**Vichy,** a town of France, in the department of the Allier; in a valley of the river of that name, 32 miles S. S. E. of Moulins. It was once a place of strength, and is celebrated for its thermal alkaline springs. The Vichy waters are in much request for disorders of the stomach and bowels, and of the urinary organs, in gout, rheumatism, etc. Much of the water is sent out in bottles.

**Vicia.** See VETCH.

**Vicksburg,** a city and county-seat of Warren co., Miss.; on the Mississippi river, about 1 mile S. of the mouth of the Yazoo, and on the Yazoo and Mississippi, the Queen and Crescent Route, and the Vicksburg, Shreveport, and Texas railroads; 45 miles W. of Jackson. The site is elevated and uneven, but in the midst of beautiful scenery. Here are St. Francis Xavier's Academy, St. Aloysius's Commercial College, Charity Hospital, waterworks, electric lights, a National cemetery (in the suburbs) where 17,000 Union dead are buried, court house, a United States government building, National and State banks, and a number of daily and weekly newspapers. Vicksburg is a port of entry, and has an extensive trade in cotton, of which it ships about 90,000 bales annually. It has railroad car shops, foundries, cotton-seed oil and lumber mills, and many smaller industries. The assessed property valuation exceeds $6,000,000. During the Civil War Vicksburg was strongly fortified by the

Confederates, who several times repulsed land and naval attacks, but were forced to surrender to General Grant, July 4, 1863, after a long siege. In 1876 the river cut through a neck of land, making the city an island. Since then the National government has been restoring the harbor at a cost of about $1,250,000. Pop. (1890) 13,373; (1900) 14,834; (1910) 20,814.

**Vico, Giovanni Battista,** an Italian author; born in Naples, Italy, in 1668; was educated by the Jesuits, and studied law. In 1697 he was appointed Professor of Rhetoric at the University of Naples, and in 1735 historiographer-royal. His "Principles of a New Science of the Common Nature of Nations" (1725) has caused him to be regarded as one of the founders of the philosophy of history. He also wrote "Antiquities of Italy"; "Wisdom"; and other works. Vico died in Naples, Jan. 20, 1744.

**Victor, Claude Perrin, Duc de Belluno,** a French military officer; born in La Marche (Vosges), Dec. 7, 1764, and at 17 enlisted in a regiment of artillery, and served eight years as a common soldier. He reënlisted in 1792, and rose rapidly; for his conduct at the siege of Toulon in 1793 he was made general of brigade. He served with distinction in the Italian campaigns, especially at Montebello and Marengo. Napoleon gave him the marshal's baton on the bloody field of Friedland (1807), and later the title of Duke of Belluno. From 1808 till 1812 he commanded the 1st Corps d'Armée in Spain, and lost the battles of Talavera and Barrosa. He commanded the 9th Corps d'Armée in the fatal Russian campaign, and covered the crossing of the Berezina. He fought at Dresden and Leipsic, lost the emperor's favor by neglecting to occupy the bridge of Montereau-sur-Yonne, and was severely wounded at Craonne. Louis XVIII. gave him the command of the 2d Division, and the presidency of the military commission appointed to try such of his old companions in arms as had deserted to Napoleon during the "Hundred Days." He was minister of war from 1821 to 1823, and died in Paris, March 1, 1841.

**Victor, Frances Auretta (Fuller) (Barrett),** an American author, sister of Metta V., with whom she published an early volume of poems. She wrote: "The River of the West" (1865); "Life and Adventures in the Rocky Mountains and Oregon" (1870); "The New Penelope and Other Stories." She also contributed chapters on Oregon for Hubert H. Bancroft's "Pacific Coast Histories." She died in Nov., 1902.

**Victor, Metta Victoria (Fuller),** an American novelist; born near Erie, Pa., March 2, 1831. She published a story, "The Silver Lute," at 13; with her sister Frances, "Poems of Sentiment and Imagination" (1851); alone but anonymously, "Fresh Leaves from Western Woods" (1853); "The Senator's Son: A Plea for the Maine Law" (1853), which had a great circulation in England and America; and "Two Mormon Wives: A Life Story" (1856). She edited the "Home Monthly Magazine" in 1856. She wrote many dime novels. The comic sketches "Miss Slimmens's Window" and "Miss Slimmens's Boarding House" (1859), and the story "Too True," were reprinted from periodicals. She wrote also the novels "Figure Eight" and "The Dead Letter"; "Passing the Portal" (1877); "The Bad Boy's Diary" (1880); "The Rasher Family" (1884); "The Naughty Girl's Diary" (1884); "Blunders of a Bashful Man" (1885). She died in Hoboken, N. J., June 26, 1886.

**Victor, Orville James,** an American author; born in Sandusky, O., Oct. 23, 1827. He edited the "Art Journal," the "United States Journal," the "Dime Biographical Library," for which he wrote many books; "Beadle's Magazine" (1866–1867); and published "History of the Southern Rebellion" (1862–1865); "Incidents and Anecdotes of the War" (1863); "History of American Conspiracies" (1864); and biographies of John Paul Jones; Israel Putnam; etc. He died March 14, 1910.

**Victor Amadeus I.,** Duke of Savoy; born in 1587, son of Charles Emmanuel I., and crowned 1630. He married the sister of Louis XIII. of France, and in his latter

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years commanded the forces of that sovereign in his Italian wars. He died in 1637.

**Victor Amadeus II.,** Duke of Savoy, and first King of Sardinia; born in 1666; succeeded his father in the duchy, in 1675. He married Maria d'Orleans, niece of Louis XIV., but entered, nevertheless, on a tortuous policy, which involved him in a war with that monarch. Having acquired Sicily, he exchanged that kingdom, in 1717, for

Sardinia, by treaty with the emperor. He died in 1732, two years after his abdication in favor of his son.

**Victor Amadeus III.,** son and successor of Charles Emmanuel III.; born in 1726, ascended the throne in 1773. He founded the Academy of Sciences at Turin, and exhibited the utmost anxiety for the welfare of his subjects. His hostility to the revolution in France provoked a contest with that country, in which his throne fell by the arms of Bonaparte. He died in 1796.

**Victor Emmanuel I.,** King of Sardinia, second son of Victor Amadeus III.; born July 24, 1759. On the abdication of his brother, Charles Emmanuel IV., in 1802 he ascended the throne. He resided at Cagliari till 1814, as his territories were held by the French. His lands were restored by the Congress of Vienna, but his reactionary measures caused a revolution, and he abdicated March 13, 1821. He died in Moncalieri Jan. 10, 1824.

**Victor Emmanuel II.,** King of Italy, son of Charles Albert, King of Sardinia; born in Turin, Italy, March 14, 1820. While heir apparent, he fought in the campaign against the Austrians, which, terminating in the disastrous battle of Novara, caused his father to abdicate. He became king in 1849, under the most unfavorable circumstances, for he had to avert the consequences of a most disastrous war, to allay faction, and to preserve the constitution; to annul which, it is said, Austria endeavored to bribe him with the offer of Parma. On securing the services of eminent statesmen, and chiefly of the illustrious Cavour, he obtained a treaty of peace with Austria on comparatively easy terms, and undertook the complete reorganization of the finances, the army, and the system of public education. After forming a close alliance with France, Victor Emmanuel, in 1859, again engaged in a war with Austria, which power, after being totally defeated in a short campaign, abandoned Lombardy to the Italians. In 1861, Victor Emmanuel was proclaimed King of Italy. In 1866, as the ally of Prussia, his army was defeated at Custozza, and his fleet at Lissa; but the success of the Prussians at Sadowa restored Venetia to Italy, the unification of which kingdom Victor Emmanuel completed in 1870, by making Rome his capital. The personal character of the first King of Italy bore a close resemblance to that of Henry IV., King of France, and, like that monarch, he possessed a bonhomie which rendered him popular among all classes of his subjects. Like Henry Quatre, too, Victor Emmanuel I. on several fields of battle displayed an almost reckless bravery; while his penchant for the fair sex was as notorious as that of his illustrious prototype. Victor Emmanuel died in Rome Jan. 9, 1878, and was succeeded by his son Humbert.

**Victor Emmanuel Ferdinand Mary Jannarius,** who succeeded to the throne of Italy as a result of the assassination of King Humbert, his father, was born on Nov. 11, 1869. As a child the Prince of Naples was weak and ailing. An English nurse did much to bring the boy around to good health though he never was robust. His mother, who is more than half German, insisted on the educational methods of that country being applied to her child, whose intellect, being naturally bright and quick but not of the massive order, was ground down instead of being improved by his studies. Modern languages (French, English, German), Latin and Greek, mathematics, philosophy, military history, kept him continually at his desk, nor could he play truant, for his tutor or keeper, Colonel Oslo, cold and inflexible, was always on duty and did not allow his ward a minute's freedom. At last the prince's health suffered to such an extent that King Humbert, becoming alarmed, determined that the mode of life led by his only son should undergo a complete change. He appointed Colonel Oslo to the command of a regiment, dismissed all the other pedagogic torturers and sent the crown prince traveling throughout Europe — to Germany, England, Greece — and to the East. When he returned the Prince of Naples had in a certain measure recovered his health; but he had lost his only chance of conquering rickets during infancy, and even now he is obliged to sustain the trunk of the body, out of all proportion to his legs, by means of a steel corset.

His military career was remarkably rapid, as is generally the case with officers in his exalted station, but he was obliged to undergo stiff examinations on being promoted, the only difference between himself and others being that he had not to wait for the usual time to elapse between one promotion and another. When in command of the military division of Naples, the crown prince was a constant guest at the tables of the Bourbon aristocracy, and on more than one occasion, it appears, the "belles Napolitaines" succeeded in capturing his heart. This little weakness, hereditary in the house of Savoy, caused his transfer to Florence, the artistic capital of Italy, which inspired the young general with more refined tastes and higher aspirations. Since his childhood his chief hobby had been numismatics, and his collection of mediæval coins is considered one of the finest in Europe.

It was said of the Prince of Naples that he was likely to be much more of a "domesticated husband" than his father has been or than his grandfather was. He is enam-

ored with a soldier's life, with sport, and with all the fashionable amusements of the day. He has not shown, possibly because he has had no great opportunity to show, that he inherits the tremendous will power of his grandsire and namesake, Victor Emmanuel II. His marriage to Princess Helena of Montenegro took place in October, 1896.

He has been a great favorite throughout Italy, for he inherits from his beautiful mother all her intellectual strength and delight in the pursuit of knowledge, while his military distinction and great bravery in circumstances of personal danger descend to him from his valiant father. He has received an education rarely bestowed even upon an heir apparent, and has profited well by it, possessing one of the most serious and cultivated minds among the princes of his generation. His tutors speak of his application with words of high praise. Besides this, he is quite an encyclopedia of Italian history, art, and literature.

***Victoria,** an Original State in the Australian Commonwealth; bounded N. by New South Wales, S. E. by the Pacific, S. by the Indian Ocean, and W. by South Australia; area, 87,884 square miles; pop. (1910) 1,303,357. It has about 600 geographical miles of seacoast, with considerable bays and indentations, especially about the middle, where Port Phillip Bay, with an area of 875 square miles and an entrance barely 2 miles wide, affords shelter sufficient for the largest fleet.

*Topography.*—The interior, though diversified by mountains, is chiefly distinguished by vast unwooded plains mostly occupied as pasture. There is one principal mountain range, a portion of the Great Dividing Range of Eastern Australia, running from E. to W. through the colony, with various offshoots. The E. portion of it, called the Australian Alps, with numerous N. and W. ramifications, rises in Mount Bogong to 6,500 feet, in Mount Hotham to 6,100 feet, and has several peaks exceeding 5,000 feet. The most W. portion, called the Grampians, runs N. and S., and in Mount William reaches a height of 5,600 feet. The Grampians and Australian Alps are connected by such ranges as the Pyrenees and Hume Range, containing numerous cones and extinct craters, and composed of metamorphic rocks of granite, quartz, syenite, etc. This is the region of the gold-fields.

*Waterways.*—The rivers are numerous, but generally small, and dry up in summer, leaving the country parched. The chief is the Murray, which rises in the Australian Alps, forms the N. boundary of the State for 980 miles, is in all 1,300 miles long, and is navigable for several hundred miles. The Yarra Yarra is a short navigable river, on which, at its entrance into Port Phillip Bay, Melbourne, the capital, is situated. Others are the Goulburn, Snowy, Glenelg, Wimmera, and Loddon. Lakes are numerous but small, and many of them are salt.

*Climate.*—The climate of Victoria is temperate, but liable to sudden fluctuations; and hot winds blow at intervals from November to February, causing great discomfort. The hottest period is in January and February, when the thermometer may rise to 108° in the shade. Some of the common English quadrupeds and birds have been introduced, such as hares, rabbits, deer, pheasants, partridges, larks, etc., and have become quite plentiful. Rabbits are now so numerous in some districts as to prove a nuisance.

*Products and Commerce.*—Victoria is the principal gold-producing State of Australia. Tin, antimony, copper, and coal are also among the minerals worked. Agriculture has much improved of late years, wheat and oats being the two cereals chiefly cultivated. The great staple of the State, however, is wool. The vine is extensively cultivated, and the wines are becoming well known in Europe. Many kinds of fruits are grown, also tobacco, hops, etc. The total imports in 1905 amounted to $108,785,504; exports, $110,935,492.

*Government.*—Victoria is divided into the four districts of Gipps Land, Murray, Wimmera, and Loddon, which are subdivided into 37 counties. The government is invested in a governor appointed by the crown, aided by an executive ministry consisting of 11 members, and a Parliament consisting of a legislative council of 35 members elected for six years and a legislative assembly of 68 members for three years. In 1905 there were 3,442 miles of railway (owned by the government). In 1906 the total revenue was $38,005,275; total expenditure, $34,715,454. The colony possesses a small permanent military force, besides militia and volunteers, and there is a small fleet of war vessels. The government of Victoria is protective, and gives bonuses on manufactures. According to the census of 1901, about 74½ per cent. of the population (896,104) were Protestants and 22 per cent. (263,710) Roman Catholics. There were 4,993 Buddhists, Confucians, etc., and 30,627 of other faiths and unspecified. Education is compulsory between the ages of 6 and 13. Besides the Melbourne University there are several colleges connected with various religious denominations.

*History.*—Victoria was first colonized from Tasmania in 1835. It made rapid progress, especially in sheep breeding, and the discovery of gold in 1851 caused a rush of population from all parts. Hitherto it had been known as Port Phillip, and formed part of New South Wales, but in this year (independently of the gold discovery) it was erected into a separate colony under the name of Victoria. In 1850 the population numbered 76,162; in 1854 it was 312,-

* For Map, see NEW SOUTH WALES.

307. In 1855 responsible government was conferred on the colony. By a series of land acts, beginning in 1860, agriculture was greatly encouraged. Subsequent to 1891 numerous measures of a strongly democratic character were enacted. In 1898 Victoria ratified the first draft of a federal constitution, and in 1901 became a state of the Commonwealth of Australia. The chief towns are Melbourne (the capital), Ballarat, Bendigo, and Geelong. See AUSTRALIA; AUSTRALIAN FEDERATION.

**Victoria,** a city of British Columbia, Canada, and capital of the province, situated on the S. E. extremity of Vancouver Island, on the Strait of San Juan de Fuca, and on the Esquimalt and Nanaimo and the Victoria and Sidney railways (parts of the Canadian Pacific and Great Northern railway systems, respectively); 84 miles by steamship from Vancouver, and 80 miles by steamship from Seattle, Wash. Railroad connections with the mainland at Vancouver are made by ferry. Esquimalt Harbor, a fortified naval station, is three miles to the W. From a scenic standpoint the city and environs are noteworthy. Fronting the city and harbor are the massive, snow-crowned Olympian mountains, and owing to the equable climate the surrounding landscape is green during most of the year. The city is regularly laid out in streets rectangular to each other. The leading business thoroughfares are Government, Douglas, Yates, Johnson, Fort, Wharf, Broad, Store, and View streets; the principal residential streets are Rockland avenue, St. Charles street, Moss street, and Oak Bay avenue. All the streets in the James bay section are fine residential streets.

*Buildings, Parks, Institutions, etc.*—The most noteworthy edifices are the parliament buildings, post office, custom house, city hall, the Empress Hotel (built by the Canadian Pacific railway), public library, the Anglican and Roman Catholic cathedrals, the Metropolitan Methodist, St. Andrew's (Presb.), and other handsome churches. Beacon Hill park, in the S. part of the city, fronts the Strait of San Juan de Fuca. Gorge park and the City park are near the waters of the Victoria Arm, just outside the city limits. North park is in the N. part of the city, and Oak Bay park is at Oak Bay, a suburb. The charitable institutions include the Provincial Royal Jubilee and St. Joseph's hospitals, Home for the Aged and Infirm, Protestant Orphans' Home, and the Home for Aged and Infirm Women. The clubs include the Union, Pacific, Canadian, Alexandra (ladies'), Arion (musical), Victoria Musical Society, Natural History, etc. There are 3 theaters, several fine hotels, 2 daily newspapers, and several weekly and monthly publications.

*Business Interests and Government.*—Cereals, vegetables, and a great variety of excellent fruit are cultivated in the surrounding district. Coal, iron, copper, gold, and silver are found. The transportation facilities, besides the railways already mentioned, include steamship lines to Seattle, San Francisco, the Alaskan ports, Australia, Japan, and China. Sealing, salmon canning, shipbuilding, fishing, and lumbering are the leading industries, and there are also breweries, tanneries, chemical and pottery works, foundries, fruit-preserving establishments, and factories of fertilizers, soap, powder, naval supplies, sashes and blinds, etc. According to the Dominion census of 1906, the value of the manufactured output for 1905 was $2,617,573. During 1906 2,525 vessels in the coasting trade and 1,108 vessels in the foreign trade entered, and 2,564 vessels in the coasting trade and 1,059 vessels in the foreign trade cleared. The city is governed by a mayor and a council of aldermen. The receipts for 1906 were $636,809 and the expenditures $639,969. The total debt in 1906 was $2,725,366. The water works and street lighting systems are municipally owned and operated.

*History and Population.*—The nucleus of Victoria was the Hudson's Bay Company's fort, built in 1843. The city was laid out in 1851 and incorporated in 1862. A great rush of goldseekers in 1858 temporarily swelled the population to between 20,000 and 30,000, mostly living in tents; but the majority soon left. Permanent growth was not marked until the completion of the Canadian Pacific railway in 1885. Pop. (1891) 16,800; (1901) 20,816; (1907, est.) 30,000, consisting of Canadians, British, Americans, Germans, Italians, French, Chinese, and Japanese.

**Victoria,** Queen of the United Kingdom of Great Britain and Ireland and Empress of India, only child of Edward, Duke of Kent (fourth son of George III.); born in Kensington Palace, May 24, 1819. Her mother, Victoria Maria Louisa (1786-1861), was the daughter of Francis, Duke of Saxe-Coburg, and sister of Leopold, King of the Belgians. Her first husband, the Prince of Leiningen, died in 1814; and in 1818 she married the Duke of Kent. The duke died in 1820, leaving his widow in charge of an infant daughter only eight months old, who had been baptized with the names of Alexandrina Victoria. The Duchess of Kent fulfilled the important duties which devolved on her with admirable care and prudence. The princess' father having belonged to the Whigs, her political education was naturally derived from the members of that party; and to Viscount Melbourne belongs the credit of having thoroughly instructed her in the principles of the British constitution. She ascended the throne of the United Kingdom on the death of her uncle, William IV., on June 20, 1837; her uncle, the Duke of Cumberland, became King of Hanover, in virtue of the law which excluded females

from that throne, and so the long connection between the crowns of England and Hanover was terminated. Victoria was proclaimed June 21, 1837, and crowned at Westminster, June 28, 1838. She found on her accession Viscount Melbourne at the head of the government; and on a change of administration (1839) she refused to change, in accordance with precedent, the ladies of the bedchamber, the result being that Peel resigned and Melbourne's administration was prolonged till 1841. The young queen was married at St. James' Palace (Feb. 10, 1840) to Prince Albert, Prince of Saxe-Coburg and Gotha, and second son of the then reigning duke.

The death of the Prince-Consort in 1861 led his widow to seclude herself for several years from public life, but, though she never afterward took so prominent a part in pub-

QUEEN VICTORIA.

lic life, she never neglected any of her essential duties as queen. Other severe trials were the deaths of the Princess Alice (of Hesse), of the Duke of Albany, and of the Duke of Clarence, her grandson. No former monarch so thoroughly comprehended the great truth, that the powers of the crown are held in trust for the people, and are the means and not the end of government. This enlightened policy entitled her to the glorious distinction of having been the most constitutional monarch Great Britain has ever seen. Not less important and beneficial was the example set by her Majesty and the Prince-Consort in the practice of every domestic virtue. Their stainless lives, their unobtrusive piety, and their careful education of the royal children bore rich fruit in the stability of the throne. The progress made by the nation in the various elements of civilization and in material prosperity was unparalleled, and perhaps during no reign was there a greater measure of political contentment. In September, 1896, her reign had reached a point exceeding in length the reign of any other English sovereign. The celebration of the occasion was postponed till June, the anniversary of her accession to the throne, 60 years previous.

Queen Victoria had four sons and five daughters: the Princess Royal, Victoria, born 1840, married in 1858 to Frederick William, afterward Emperor of Germany; Albert Edward, Prince of Wales, born in 1841, and married in 1863 to Alexandra, daughter of the King of Denmark; Alice, born in 1843, married in 1862 to Prince Frederick-William of Hesse, died in 1878; Alfred, born 1844, created Duke of Edinburgh 1866, married in 1874 to Marie, daughter of the Emperor of Russia, died in 1900. Helena, born 1846, married in 1866 to Prince Christian of Denmark; Louise, born 1848, married in 1871 to the Marquis of Lorne; Arthur, born in 1850, created Duke of Connaught 1874, married in 1879 to Princess Louise Marguerite of Prussia; Leopold, born 1853, created Duke of Albany in 1881, married to Princess Helena of Waldeck in 1882, died 1884; and Princess Beatrice, born 1857, married in 1885 to Prince Henry of Battenburg, died 1896. In the fall of 1900 the queen's health began to fail, and she died in Osborne House, Isle of Wight, Jan. 22, 1901.

**Victoria,** in Roman mythology, one of the deities of the Romans, called by the Greeks Nikê. She was Sister of Strength and Valor, and was one of the attendants of Jupiter. Sylla raised her a temple at Rome, and instituted festivals in her honor. She was represented with wings, crowned with laurel, and holding the branch of a palm tree in her hand.

**Victoria and Albert, Royal Order of,** an order instituted by Queen Victoria, Feb. 10, 1862, in memory of the Prince-Consort, who died Dec. 14, 1861. It was enlarged Oct. 10, 1864, Nov. 15, 1865, and again on March 15, 1880. It consisted of her Majesty, as Sovereign of the Order, and 15 ladies of the royal families of Europe, who form the first class. The second class consisted of eight ladies of the royal families of Europe, and related to the British royal family. The third class included 21 lady members of the British nobility, and the fourth class 15 lady members of the nobility and gentry. The badge is composed of likenesses in profile of her Majesty and Prince Albert, surmounted by a border of precious stones (different for each class) for the first, second and third, and the monogram "V. A." for the fourth class, all surmounted by an imperial crown. Ribbon, white moiré.

**Victoria Cross,** an English naval and military decoration instituted by royal warrant, Jan. 29, 1856, and bestowed for "conspicuous bravery or devotion" to the country in the presence of the enemy. It is the most coveted of all British decorations, and is open to all officers and men of the regular, auxiliary, and reserve forces. It consists of a bronze Maltese cross with the royal crest in the center, and underneath an escrol bearing the inscription, "For Valor." It is worn attached to the breast by a blue ribbon in the case of the navy, and by a red in the case of the army. For every additional act of bravery an additional clasp may be added. The cross carries with it a special pension of $50 a year, and each additional clasp an additional pension of $25 a year.

VICTORIA CROSS.

**Victoria Nyanza,** a great fresh-water lake in East Central Africa, situated on the equator; area, over 30,000 square miles. It lies about 3,880 feet above sea-level.

VICTORIA REGIA: NATURAL STATE.

The geological evidence points to the origin of its basin having taken place at a very remote period, a number of terrace-like faults along the W. shores suggesting a series of immense landslips as a probable cause of the formation of the hollow which now contains the lake. The traces of volcanic action do not seem sufficient to account for so large a depression. The prevailing rocks are gneiss and schists, with porphyritic granite at the S. extremity, and some lava and ironstone toward the N. The igneous area is, upon the whole, barren and desolate looking, the remainder of the basin being clothed with luxurious tropical flora, exceedingly varied in character. This variety is, perhaps, most strikingly exhibited on some of the islands. The fauna is also varied, the number of alligators frequenting the waters being very large. Hippopotami, though less frequently met with, are exceedingly fierce, and are held in great dread by the native boatmen. The water is good and fresh, though somewhat insipid to the taste, and frequently assumes a dirty white color. The lake is drained by the Nile, and its chief feeders are the Kaject, the Nzoia, the Shimiyu, and the Katonga. As these are all comparatively insignificant streams, and the evaporation from such a large body of water in an equatorial climate must be very great, it is supposed that the lake draws the larger part of its supply from springs in its bed. Tides have been noticed along the shores, the rise lasting from about half an hour to an hour in time; from such observations as have been made, the winds do not appear to exercise much influence on this curious phenomenon. The natives assert that a periodical rise and fall in the level of the lake takes place at intervals of about 25 years, and the water markings along the coast, noted by recent travelers, are believed to lend an appearance of truth to the statement. Cyclonic storms, accompanied by thunder and lightning, are common, and occur most frequently in the month of August. Fishing is mostly carried on by the use of the rod and line, except in Lower Kavirondo and among the Ba-Sesse people, where grass mats and basket traps are used as nets. The lake, whose native name is Ukerewe, was discovered by Speke in 1858, visited by him and Grant in 1861–1862, and subsequently partly explored by Stanley (1875), Mackay, Thomson, and others.

**Victoria Regia,** a genus of *Euryalidæ,* akin to *Euryale,* from which it differs by the sepals being deciduous, by the petals gradually passing into stamens, and by the cells of the ovary being more numerous. Species, one or three. The type is *Victoria regia,* named by Lindley after Queen Vic-

toria. It is the most magnificent of all known water lilies, and is the more acceptable that it came from a region in which it had been supposed that no *Nymphæaceæ* occurred. It was first discovered by the botanist Hænke in 1801; Bonpland afterward met with it. Orbigny, in 1828, sent home specimens to Paris; others also subsequently saw it growing, but it excited no attention till, in 1837, Sir Robert Schomburgk found it in the Berbice river in British Guiana. The rootstock is thick and fleshy, the leaf-stalks prickly, the leaf peltate, its margin circular, its diameter from 6 to 12 feet, the edge so turned up as to make the leaves floating in tranquil water look like a number of large trays. The leaves are green above, and covered with small bosses, below they are deep purple or violet; the undeveloped flowers are pyriform; the sepals four, each about seven inches long by four broad, purple externally, whitish internally; the petals numerous, in several rows, passing insensibly into stamens, fragrant, the outer ones white, the inner ones roseate; stamens numerous, the outer fertile, the inner sterile; ovary many celled, cup-shaped above, with many small stigmas along its upper margin; fruit a prickly berry. A native of South American rivers, especially the

VICTORIA REGIA: EXPANDED BLOSSOM.

tributaries of the Amazon. The seeds are said to be eatable, and the plant is in consequence called water maize by the natives of the region where it grows.

**Victoria Strait,** a broad arm of the sea in Arctic regions, separating Victoria Land on the W. from Boothia Felix and North Somerset on the E.

**Victorious City,** Cairo, in Egypt. The term has reference to the signification of its Arabic name — *El Kahvia,* "the victorious."

**Victorious, Petrus,** an Italian scholar; born in Florence, Italy, July 11, 1499, studied at Rome. He was one of the greatest critics of the Renaissance in Italy. He prepared editions of the works of Æschylus, Terence, Sallust, Varro, Hipparchus, and other early writers. He died Dec. 18, 1584.

**Vicuna,** in zoölogy, the *auchenia vicugna,* a native of the most elevated localities of Bolivia and Northern Chile. It is very wild, and has resisted all attempts to reduce it to a state of domestication. It is the smallest species of the genus, standing only about 30 inches at the shoulder. Col-

THE VICUNA.

oration nearly uniform lion-brown, tinged with yellow on the back and fading into gray on the abdomen. It is extremely active and sure-footed, and is seldom taken alive. In habit it somewhat resembles the chamois, as it lives in herds in the regions of perpetual snow. The soft, silky fur is in much request for making delicate fabrics, and many thousands of these animals are slaughtered annually for the sake of the skins.

**Vicuña, Manuel,** a Chilean archbishop; born in Santiago, Chile, in 1778. He was graduated in theology at the College of San Carlos, and entered the Church. He inherited a fortune which he employed in building a house of retirement. Was made a bishop in 1830, and confirmed as an archbishop in June, 1840. He died in Valparaiso, in 1843.

**Vicuña, Pedro Felix,** a Chilean journalist; born in Santiago, Chile, in 1806. Received a good education, and early began to write for the press. Founded "El Mercurio." Was afterward a member of the editorial staff of "El Censor," "El Elector," "El Republicano," and "La Reforma." He was elected to the senate in 1865. He died in Santiago, in 1874.

**Vicuña-Mackenna, Benjamin,** a Chilean historian; born in Santiago, Chile, in 1831. He was concerned in many revolutions, traveled extensively, and held many political positions. In 1870 he acted as war correspondent during the Franco-German War; later as correspondent of the "Mercurio" in Berlin and Paris. At the opening of the war with Peru he became

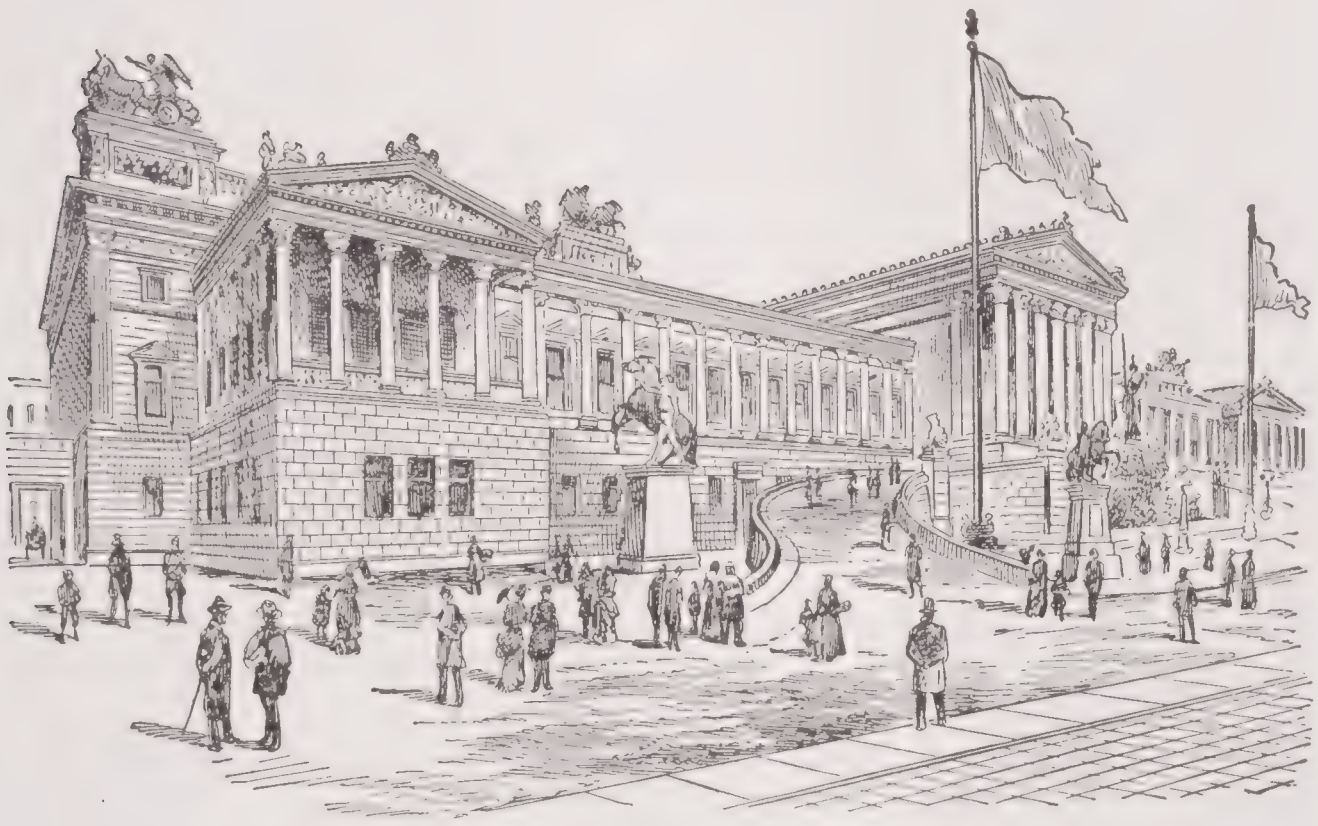
editor of "El Nuevo Ferrocarril"; and after the conclusion of the war his description of it became well known for its impartiality. He wrote "The Siege of Chillan in 1813" (1849); "History of Santiago" (2 vols. 1868); "Francisco Moyén; or, What the Inquisition in America Meant" (1868); several books on the mineral riches of Chile (1883); "Album of the Glory of Chile" (1883); "Dolores" (1883); "The Isles of Juan Fernandez" (1884); "At a Callop" (1885); "The War in Spain" (1887); and many others. He died in Santa Rosa del Colmo, Jan. 25, 1886.

**Vidian Canal,** in anatomy, a canal passing horizontally from before backward through the sphenoid bone, at the base of the internal pterygoid plate. It transmits the vidian nerve and vessels. Called also the pterygoid canal.

**Vidocq, Eugene François,** a French detective; born in Arras, July 23, 1775. He was the son of a baker and was a thief from his childhood. He entered the army, was wounded and discharged, and began the life of a vagabond. In 1796 he committed forgery, for which he was sent to the galleys for eight years. Contriving to escape he joined a band of highwaymen, but was expelled by them after taking a solemn oath not to betray them. He at once went to Paris and disclosed their hiding place to the authorities. He then became a detective and with his comrades made some wonderful discoveries of burglaries, etc., which it was afterward claimed were committed by his own men. After his dismissal from the force in 1825, he engaged in some dishonest business operations. He wrote a history of his experiences, but, from his well-known lack of veracity, it was not considered authentic. He died April 28, 1857.

**Vidua,** in ornithology, a genus of *Ploceideæ*, with seven species, from tropical and Southern Africa. Bill compressed nostrils hidden by plumes; wings third to fifth quills longest, first, spurious; tail feathers and tail coverts lengthened variously; tarsi with divided scales in front.

**Viedoff, Heinrich,** a German historian of literature; born in Büttgen near Neuss, April 28, 1804. He wrote: "Introduction



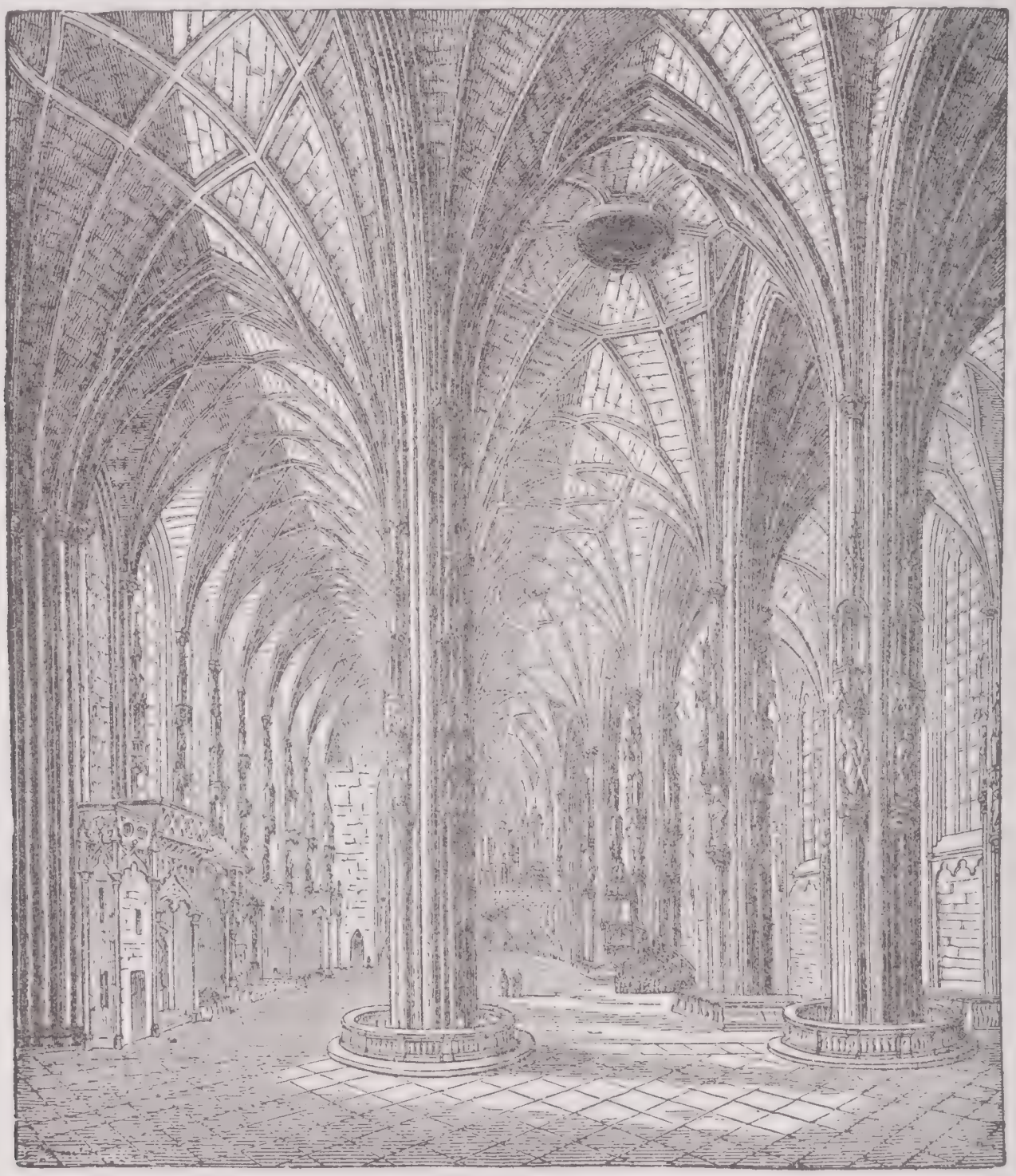
VIENNA: PARLIAMENT BUILDING.

to the Art of Poetry" (1860); "Goethe's Poems: with Notes" (3d ed. 1874); "Manual of German National Literature" (16th ed. 1881); "Life and Works of Goethe" (5th ed. 1887); "Schiller's Poems: with Notes" (6th ed. 1887); "Life of Schiller" (2d ed. 1888); "Odysseus and Nausicaa," a tragedy in five acts, an amplification of Goethe's play. He made many metrical translations of all of Racine's plays, 3 of Molière's, 11 of Shakespeare's, all the plays of Sophocles, Scott's "Lady of the Lake," Longfellow's "Evangeline," and Ausonius's "The Moselle." He died in Treves, France, in 1886.

**Viele, Egbert Ludovikus,** an American civil engineer; born in Waterford, N. Y., June 17, 1825; was graduated at the United

States Military Academy in 1847; took part in the Mexican War in 1847–1848 and in the campaign against the Indians in 1848–1852; served as State Engineer of New Jersey in 1854–1856, and was chief engineer and designer of Central Park in New York and of Prospect Park in Brooklyn in 1856–1860. During the Civil War he commanded the land forces at the capture of Port Royal; directed the investment of Fort Pulaski, Ga.; planned and led the march on and capture of Norfolk, Va., and was military governor of that city in 1862–1863. Subsequently he was park commissioner of New York city, a Democratic member of Congress, and vice-president of the American Geographical Society. In 1896 he appeared before the commission of the British House of Lords on the subject of municipal administration. His publications include "Handbook of Active Service" and "A Topographical Atlas of the City of New York." He died April 22, 1902.

**Vienna** (German, Wien), the capital and largest city of the Austrian empire; in Lower Austria, on the Danube canal, a branch of the Danube. The small river Wien flows through part of the city to join the canal. Vienna consists of the Inner City and eight districts or sections completely surrounding it — viz., Leopoldstadt, Landstrasse, Wieden, Margarethen, Mariahilf, Neubau, Alsergrund, and Favoriten. These, with the exception of the last, an artisans' quarter, are enclosed by fortifications known as the Lines, though that name is now usually confined to the 15 gates of the fortifications. Immediately beyond the Lines are nine populous suburbs included (since 1890) within the Vienna police district, which has a total area of 51 square miles, and pop. (1909) of 1,999,-



VIENNA: INTERIOR OF ST. STEPHEN'S CATHEDRAL.

Vienna

912. The irregular hexagon formed by the Inner City was till 1858 enclosed by an inner line of fortifications, the site of which is now occupied by the Ringstrasse, a series of handsome boulevards, 55 yards wide, which bound five of its sides. The sixth side is bounded by the Franz-Josefs Quay, on the Danube canal.

Though Vienna contains buildings of the 14th and even of the 13th century, it is, in its present form, essentially a modern city; nearly all the most conspicuous and pretentious public buildings date from the later half of the 19th century. Modernity too is

VIENNA: CHURCH OF ST. CHARLES BORROMEO.

characteristic of the Viennese; they are sprightly, good-tempered, and pleasure-loving, fond of music, dancing, and the theater. The Inner City and the Ringstrasse are the handsomest and most fashionable quarters. In the former are the cathedral of St. Stephen (1300–1510), with a tower 450 feet in height; the Hofburg or imperial palace, a large and irregular pile of very various dates; and many palaces of the nobility. On one side or other of the Ringstrasse rise the Exchange; the University (1874–1884); the huge Gothic New Rathhaus (1873–1883), built at a cost of over $3,750,000; the Parliament House; the Supreme Law Courts; the Imperial Museums of Natural History and of Art (1872–1886), twin buildings on either side of the imposing monument of the Empress Maria Theresa (unveiled 1888); the imperial Opera House; the Academy of Art; the Austrian Museum of Art and Industry, etc. In other parts of the city are the Arsenal; the Josephinum, a medical college founded in 1784; the Votive Church, an admirable specimen of modern Gothic, built in 1856–1879 to commemorate the emperor's escape from assassination in 1853; and many other handsome sacred and secular edifices. Vienna is well provided with public parks, the largest being the Prater (7 square miles), one of the finest parks in Europe, opened in 1766. In educational, scientific, artistic, and benevolent institutions the city is very rich. The university, founded in 1365 and renowned throughout the world as a medical school, has a teaching staff of 350 and over 6,000 students. The magnificent public picture gallery, formerly in the château of Belvedere, now in the Museum of Art, is specially famous for its unrivalled examples of the Venetian school, Rubens and Dürer. There are also several noted private galleries. The Public Hospital, with 2,000 beds, is perhaps the largest hospital in Europe.

Vienna is the chief industrial city in the empire, the factories being mostly in the districts of Neubau and Mariahilf and outside the Lines. Machinery, scientific and musical instruments, artistic goods in bronze, leather, terra-cotta, porcelain, etc., bent-wood furniture, meerschaum pipes, etc., are among the noted manufactures of Vienna. As a center of trade and finance Vienna is no less important. Grain, flour, cattle, seeds, wines, and manufactured goods of all kinds are annually handled here to an immense aggregate value. Over $12,500,000 were spent in 1868–1881 in regulating the channel of the Danube so as to render the river navigable at all times, and a new mercantile quarter is gradually springing up between the canal and the main stream.

The chief local authority is the Gemeinderath, or city council (consisting of a burgomaster, two vice-burgomasters, and 120 councillors), which is assisted by lo-

cal committees or councils in the various districts.

Vienna occupies the site of the Roman Vindobona, which was established in A. D. 14, as the successor of the Celtic settlement of Vindomina. The beginning of its present importance, however, dates only from the period of the Crusades, which directed a steady stream of traffic through it. In 1276 it became the capital of the Hapsburg dynasty. The famous siege of Vienna by the Turks lasted from July 14 to Sept. 12, 1683, when it was relieved by John Sobieski of Poland.

Treaties have been concluded at Vienna in 1738, between the Emperor Charles VI. and the Infanta of Spain as to the kingdom of the Two Sicilies; in 1809, between Napoleon and the Austrians, after the defeat of the latter at Wagram; in 1864, settling the affairs after the war of Prussia and Austria against Denmark; and in 1866, between Francis Joseph of Austria and Victor Emmanuel of Italy, ceding Venetia to Italy. The Great Congress of Vienna (Sept. 20, 1814 to June 10, 1815) met to regulate the affairs of Europe after the overthrow of the Napoleonic empire, and restore the "balance of power." Alexander I. and Nesselrode were there in the interests of Russia; the King of Prussia was supported by Hardenberg; Castlereagh, and afterward Wellington, represented Britain; Metternich was Austrian plenipotentiary; Tallyrand secured a hearing for France; Spain, Portugal, Sweden, Denmark, Rome, and the minor German states were also represented. The chief final outcome was that Austria obtained Lombardy, Venetia, Illyria, Dalmatia, Tyrol, Vorarlberg, Salzburg, and East Galicia; Prussia the province of Saxony, Posen, Swedish Pomerania, Westphalia, and the Rhenish Province; Hanover, extended in area and made a kingdom, fell to the Hanoverian dynasty in Great Britain; Great Britain secured Malta, Heligoland, Cape Colony, and Mauritius, and the protectorate of the Ionian Islands; Belgium and Holland were united as the kingdom of the Netherlands; Norway was confirmed to Sweden; the duchy of Warsaw (Poland) was made over to Russia, and the republic of Cracow was constituted; the neutrality of Switzerland was guaranteed, and Neuchâtel (under Prussian sovereignty) added to the confederation; the German confederation was constituted with numerous internal rearrangements; and the former ruling houses were reinstated in Naples, Sardinia (to which Genoa was annexed), Tuscany, and Modena, Parma being given to the ex-Empress Maria Louisa; the papal See recovered nearly all its possessions; and France was restricted to very nearly the territory it possessed before the Revolution. The signing of the treaty, July 9, was hastened by the news of Napoleon's return from Elba. The Jews have been predominant in medicine and law professions, banking, the press, and many manufactures; and here also Anti-Semitism is very rampant. See AUSTRIA-HUNGARY.

**Vienna Basin,** in geology, a series of beds — the lowest Oligocene, the highest Pliocene — found in a basin-shaped hollow in the older rocks in and around Vienna. The Oligocene contains remains of *Mastodon tapiroides, Rhinoceros sansaniensis,* etc., and the Pliocene, dinotherium, mastodon, rhinoceros, machairodus, hyæna, cervus, antilope, etc., with birch, alder, oak, beech, chestnut, hornbeam, liquidambar.

**Vienne,** a department in the W. of France, constituted mainly of the old province of Poitou, between Indre and Deux-Sèvres; area, 2,711 square miles; pop. (1906) 333,621. The Vienne, an affluent of the Loire, is the principal river, and has the Creuse as its chief tributary. The surface is mostly flat, with a gradual slope toward the N. The country consists almost wholly of fertile plains, fine pasture lands, and extensive forests. The mineral riches comprise iron, manganese, and quarries of stone, including lithographic stone. Poitiers is the capital.

**Vienne,** one of the most ancient towns of France, in the department of Isère; on the Rhone, 19 miles S. of Lyons. The river Gère passes through the town, and here joins the Rhone, after having supplied motive power to a number of mills and factories. Vienne was the chief town of the Allobroges, is mentioned by Cæsar, and by Martial, who calls it the rich Vienne; in the time of the Roman emperors it was the rival of Lyons. Besides numerous water conduits, etc., of Roman construction, there are a Corinthian temple of Augustus and Livia, remains of a theater and an obelisk, called The Eagle, 72 feet high; and the museum containing many relics of Roman antiquity. The cathedral of St. Maurice, partly Romanesque, partly Gothic, was built in 1107–1251; St. Peter's dates from the 6th century. The town was prominent under the Burgundian princes, and its archbishop disputed with his neighbor of Lyons the primacy of Gaul. In 1312 a council was held here, in which Pope Clement V. pronounced the suppression of the order of the Templars. There are manufactures of woolens, silk, paper, leather, and iron goods, and trade in grain and wine. Pop. (1901) 24,619.

**Vienne, Haute,** an interior department of France, S. E. of Vienne; bounded on the W. by the departments of Vienne, Charente, and Dordogne; area, 2,130 square miles; pop. 385,732. It is watered by the Vienne and its tributaries. The surface is for the most

part level, though not fertile, but is traversed by ranges of low hills, including the Monts du Limousin. There is much cattle breeding. Kaolin is the chief mineral product, and much porcelain is made.

**Vieques,** an island 13 miles E. of Porto Rico; 21 miles long and 6 miles wide. Its land is very fertile and adapted to the cultivation of almost all the fruits and vegetables that grow in the West Indies. Cattle are raised and sugar cultivated. The chief town, Isabel Segunda, is on the N. side, and its harbor is unsafe when N. winds prevail. The few ports on the S. side are better, the best being Punta Arenas. All supplies are brought from San Juan, the majority being of American origin. The climate is mild and healthful and the island has never been visited by any contagious disease. Pop. (1899) 6,642.

**Vieta,** or **Viete, Franciscus,** a French mathematician; born in Fontenai-le-Compte, near La Rochelle, in 1540. He seems to have been entirely self-taught as a mathematician; was *maitre des requestes* at Paris under Henri III. and Henri IV., and did valuable service to his government in the decipherment of the secret communications of the Spanish court. The reformed Gregorian calendar of 1582 was attacked by Vieta, who published what he deemed a more correct one in 1600, supplementing this publication by a vehement expostulation two years later. His death at Paris in 1603 probably prevented any action being taken against him similar to what Galileo experienced some years later. Vieta was the first to employ letters in algebra to signify quantities, and first systematically combined these with symbols of operation, thus greatly facilitating the application of algebraic methods to the working of problems. Besides thus being the founder of modern algebra, he greatly developed the theory of equations, and by means of his improved methods widely extended trigonometry, discovering the relations of multiple angles, and completing the solution of right-angled spherical triangles. He also gave an expression for the approximate quadrature of the circle. His works were collected and published by Schooten in 1646; but this edition does not contain the "Harmonicon Celeste," of which two MSS. exist in Florence and Paris, and the "Canon Mathematicus" (1579), which contains the first complete table of the circular functions.

**Vieux Moustache.** See GORDON, CLARENCE.

**Vieuxtemps, Henri,** a French composer; born in Verviers, Belgium, Feb. 20, 1820; began to give concerts in his 13th year, and after completing his studies at Vienna and Paris spent most of his time in traveling from place to place as a performer till in 1870 he became a teacher in the Brussels conservatoire. He retired in 1873. His works comprise concertos, fantasies, and dances for the violin. He died June 6, 1881.

**Vigfússon, Gudbrand,** a Scandinavian scholar; born in Frakkanes, Iceland, March 13, 1827. He was educated first at the high school of Reikiavik, afterward at Copenhagen University. He lived in Copenhagen from 1849 till 1864, having devoted himself to the study of old Icelandic literature. His first work, "Timatal," on the chronology of the Sagas, was published in 1855, and revealed the hand of a master. In 1858 he brought out the "Biskupa Sögur, or Lives of the Icelandic Bishops," and in 1864 the "Eyrbyggja Saga." In the latter year he came to England to undertake the Icelandic-English lexicon, begun by Cleasby, and in 1866 began at Oxford this work, which kept him engaged for seven years, the result being the excellent dictionary issued from the Clarendon Press. In 1878 the Clarendon Press published his "Sturlunga Saga," to which he prefixed "Prolegomena" containing a complete history of the classic literature of Iceland. This was followed by several minor works and essays by the "Orkneyinga Saga" and "Hakonar Saga" and by the "Corpus Poeticum Boreale" (in conjunction with F. York Powell), a complete collection of the ancient Icelandic poetry, with translation. He was latterly engaged upon a work entitled "Origines Islandiæ," but died before its completion. In 1884 he was appointed lecturer in Icelandic and kindred subjects at the University of Oxford. He died in Oxford, England, Jan. 31, 1889.

**Vigil,** in ecclesiastical and Church history, originally the watch kept on the night before a feast (from the 11th or 12th century) the day and night preceding a feast. The practice of spending the night in public prayer, which is probably older than Christianity, prevailed in the early Church, and down to the 14th century was the usual prelude to the greater festivals. But there were many objections to the custom, which, from about that date was gradually discontinued. In the Roman Church the Midnight Mass before the feast of Christmas is the only relic of the old custom. Broadly speaking, the vigils of the Roman Church have been transferred to the English Prayer Book. Theoretically, all vigils are fast-days, but in the Roman Church the customs of different countries vary slightly. Also the devotional exercises or services appropriate to the vigil or eve of a festival.

**Vigilance Committee,** a committee or body formed to watch the progress or carrying out of some measure, or for the pur-

pose of protecting certain interests supposed to be imperiled, or for restraining any abuse or nuisance. In the United States the term vigilance committee is used to denote a band of citizens organized to summarily punish crime, or prevent the commission of crime, in such instances as the civil and lawfully constituted authorities seem powerless to reach these desired results.

The vigilance committee has never been a popular institution in the older portions of the United States, but has found its principal growth in the newly settled communities, and especially in those localities in which the presence of a large foreign element seemed at times to menace the preservation of good order, life and property. The most noted vigilance committees in the history of the country were those formed in San Francisco, and contiguous territory in the Western States, and in New Orleans, in the S. portion of the Union. In the earlier years of San Francisco the city was so overrun with the lawless element among the miners and adventurers that the administration of justice became in the hands of the constituted authorities but a travesty. It was then that the work of the vigilance committee, or Vigilantes, as they were styled, began. That work was short, sharp and terrible. Thieves and murderers were hanged on every side, while others were forced to seek safety in flight. As the mining operations extended E. into Nevada and Montana, the work of the vigilance committee was again called into requisition, with the happy effect of clearing the country for a time at least, of a large portion of the lawless element.

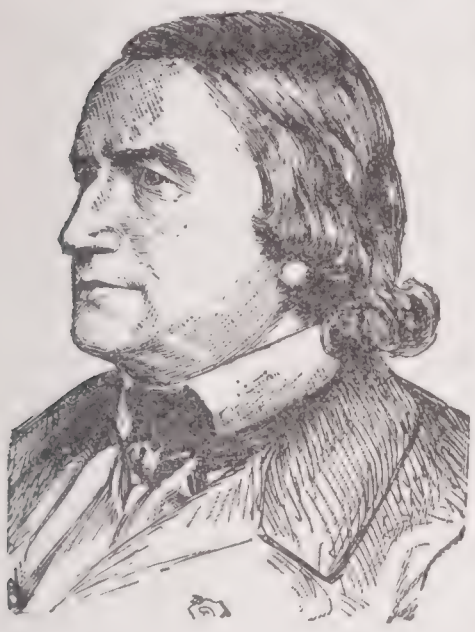
One of the most noted members of the Montana vigilance committee was "Judge" Alexander Davis, under whose direction the notorious outlaw Slade was hanged at Virginia City early in the sixties. Slade had himself been a most useful man in clearing the country of desperadoes, but had, under the influence of drink, committed some notorious and heinous crimes. He was warned to amend his ways, but defied the court and threatened the judge with a loaded pistol. The result was that he was overpowered and taken by a body of several hundred miners and hanged. In New Orleans the last instance of the organization of a vigilance committee was in 1891, when a body of citizens took from the city jail a number of Italians, suspected of being members of the Italian fraternity of murderers, known as the Mafia, and accused of being the murderers of Chief of Police David Hennesey, and put them to death by shooting and hanging. This action produced serious complications between the Italian government and that of the United States, and partook more of the nature of mob violence than the work of the vigilance committees of the Western States, who to excuse their actions could truthfully allege the inability of the civil authorities to meet the exigencies of the case. Directly after the Civil War, there were frequent lynchings of murderers and ravishers in the South, but these actions were rather those of an infuriated mob than those of a well-organized, coolly-conducted committee. In various rural districts bands of men under different names have attempted to mete out punishment to obnoxious persons, but these efforts have been generally sternly repressed by the authorities. See WHITECAPS.

**Vigna** (named after Dominic Vigna, a commentator on Theophrastus), in botany, a genus of *Phaseoleæ;* papilionaceous plants, with nearly cylindrical legumes constricted between the seeds, which are separated by thin, spurious partitions. Known species more than 30, chiefly from the tropics. *V. catiang* (=*Dolichos sinensis*) has a legume about two feet long, with a number of pea-like seeds, which are used for food, or the young legume may itself be cooked with its contents. The plant is cultivated throughout the tropics, and is used in India to strengthen the stomach, but it is said to be hot, dry, diuretic, and difficult of digestion. *V. pilosa* is also cultivated in India and Burma.

**Vignaud, Jean Henry,** an American diplomatist; born in New Orleans, Nov. 27, 1830; engaged in teaching and newspaper work till the outbreak of the Civil War, then became a captain in the 6th Louisiana Regiment; was taken prisoner at New Orleans in 1862. After his release, as secretary of the Confederate Diplomatic Commission, he went to Paris in 1863. He was connected with the Alabama Claims Commission in 1872, and in the following year was a United States delegate to the International Metric Conference. He was made second secretary to the American legation in Paris in 1875 and first secretary in 1882. After a service in Paris of 34 years, he resigned in 1909, was presented with $20,000 by American friends, and was retained at the embassy as an advisor.

**Vignette,** an ornament of vine leaves, tendrils, and grapes, used in Gothic architecture. A capital letter in ancient manuscripts; so called in consequence of their being frequently ornamented with flourishes, in the manner of vine branches or tendrils. Subsequently the term was used to signify any large ornament at the top of a page. In printing, a small ornamental engraving without complete background or boundary line, used in printing for the illustration or decoration of a page of any work.

**Vigny, Alfred Victor, Comte de,** a French author; born during his parents' imprisonment in the prison at Loches (Indre-et-Loire), March 27, 1797; entered the army at the Restoration; and served 14 years. Garrison life wearied a soul athirst for glory, but his pride found a solitary consolation in verse. As early as 1822 he published anonymously a small volume of verse, followed in 1824 by "Eloa, or the Sister of an Angel," an exquisite piece of mystic phantasy. Before the Revolution of July he had published his collected "Poems, Antique and Modern" (1826), containing "Moïse" and "Dolorida"; "Cinq Mars" (1826), a historical romance; a translation of "Othello" (1829); and a drama "The Farrier of Ancré" (1830). After that year he published only works in prose: "Stello" (1832); "Grandeur and Military Servitude" (1835); and a drama, "Chatterton" (1835) — the highest moment of his fame. From that time he ceased not to write but to print. He left a volume of verse — "Destinées" — published in 1864, which contains some of his finest and most virile work, and a collection of personal notes, printed with doubtful wisdom by Louis Ratisbonne under the title "Journal of a Poet" (1867). While still young he attached himself to the Romanticists, with Hugo, Deschamps, Mme. Desbordes-Valmore, and Mdlle. Delphine Gay. But he was never a militant or thorough-going member of the party — "he retired," says Sainte-Beuve, "to his ivory tower before the heat of the day." His "Fifth of March" was a romance based on the most tragic of the crimes of Richelieu, inspired by Scott, but intended to be minutely true to history throughout. The author's connection with the theater led to an equivocal friendship with Mme. Dorval, commencing about the close of 1830, but the woman's heart soon found poetry a poor substitute for passion, and the tragedy left the poor idealist stripped of his last illusion. In 1845 Vigny was gratified by election to the Academy, on which occasion he made a long and wearisome address, which was listened to with unconcealed impatience. Thereafter till the close he lived but little in the world, in familiarity with no one, not even himself, his thought wrapped up in a pessimistic gloom from which he found escape only by the avenues of art. His was that profoundest kind of moral misery which needs no external reason for its being, incurable because itself its own poison. He died in Paris after the long agony of cancer, Sept. 17, 1863. Vigny's work was elegant but cold. No poet has had grander conceptions than the few fundamental ideas that inform his work, and it is not so much inspiration as meditation that gives the key note to all his poetry.



ALFRED DE VIGNY.

**Vigo,** a seaport town of Spain, in the province of Pontevedra. It is enclosed by a wall and trench, and has an excellent harbor with deep anchorage close in-shore. It was captured by the English in 1719. It has a lazaretto, a fortress, an export trade in wine, bacon and maize, and a prosperous pilchard fishery. It is a port of call of several steamship lines. Pop. about 16,000.

**Vijayanagar,** a ruined city 8 miles in circuit, in Madras province, British India; about 40 miles to the N. W. of Bellary, in a plain encumbered with granite rocks, many of which have been rudely sculptured into a variety of forms. After having been for two centuries the metropolis of a powerful Hindu kingdom, Vijayanagar was sacked and ruined by the Mohammedans of the Deccan in 1565. At that date it is described as 24 miles round. The ruins of the ancient city, the building of which was begun in 1336, now cover 9 square miles. The modern village on its site is called Hampi.

**Viking,** a rover or sea robber belonging to one of the bands of Northmen who scoured the European seas during the 8th, 9th, and 10th centuries. This word has been frequently confounded with sea-king, a term which is applied to a man of royal race, who took by right the title of king when he assumed the command of men, although only of a ship's crew; whereas the former term is applicable to any member of the rover bands.

**Vilaine,** a river of France which rises in the department of Mayenne and flows into the Atlantic at Penestin, in the department of Morbihan. It is 150 miles long, the last 80 of which are navigable. Its principal tributaries are the Ille, Oust, Cher, Don, and Isac.

**Vilas, William Freeman,** an American lawyer; born in Chelsea, Vt., July 9, 1840; removed to Madison, Wis., in 1851; and was graduated at Wisconsin University in 1858. He was admitted to the bar in 1860, and on the outbreak of the Civil War enlisted in the Union army in which he served till 1863; was Postmaster-General in 1885–1888; and subsequently was Secretary of the Interior in President Cleveland's cabinet in 1888–1889. He was United States Senator

in 1891-1897, becoming a Gold Democrat in 1896. He died Aug. 27, 1908. .

**Vilayet,** a name officially applied since 1865 to the large administrative districts of Turkey.

**Villa of Tears,** a name popularly bestowed on a house in the suburbs of Coimbra, Portugal, the scene of the death of Inez de Castro.

**Villafranca,** a town of Italy, in the province of Verona, on the Tartaro. It is celebrated as having been the center of the wars of 1848 and 1866. The preliminaries of peace between Napoleon III. and the Emperor of Austria were signed here, July 11, 1859.

**Village Communities,** the means by which many scholars contend that great part of Europe must have been brought into cultivation. A clan of settlers took a tract of land, built their huts thereon, and laid out common fields, which they cultivated in common as one family. The land was divided out every few years into family lots, but the whole continued to be cultivated by the community subject to the established customs as interpreted in the village council by the sense of the village elders. This may still be seen in the villages of Russia, and even in some parts of England may still be traced the ancient boundaries of the great common field, divided lengthwise into three strops (one fallow, the two others in different kinds of crop), and again crosswise into lots held by the villagers. This theory, often called the mark system, was started by Von Maurer in Germany, but mainly owes its currency to Sir Henry Maine, who in his work entitled "Village Communities in the East and West" (1871) pointed out close parallels in the archaic land communities in India. The first serious attack upon the theory was made by F. Seebohm, in his work "The English Village Community Examined" (1883; 4th ed. 1890), which labors to prove that the ancient village community was not originally free, but traces back to the Roman manorial system of a community in serfdom under a manor with its lord. Fustel de Coulanges dealt Von Maurer's theory a still more deadly blow by turning against him the evidence of the Leges Barbarorum and early chartularies on which his argument mainly relied. He proves also that the Russian *mir* does not represent agrarian communism, the soil belonging not to it but to some one else, and the peasants merely paying rent collectively as well as cultivating the land collectively. The primitive mark, the association of the mark (*Markgenossenschaft*), the original common land (*Gemeinland* or *Allmende*) — all the evidence for these he weighs and finds wanting, contending that the whole imposing structure of argument has been erected out of a series of misunderstandings, national communism having been confused with the common ownership of the family, tenure in common with ownership in common, agrarian communism with village commons.

Mr. Gomme considers Lauder and Kells as surviving types of the tribal community in its most primitive form; besides the example of Hitchin, from which Mr. Seebohm started working back, he examines the cases of Aston village, in the parish of Bampton, Oxfordshire, Chippenham in Wiltshire, Malmesbury, and others, his conclusion being that the village community is no modern institution, but one beginning far back in the history of human civilization, and probably a phase through which all peoples have passed. In the hill cultivation and settlement, of which many traces remain, he sees evidence of pre-Aryan influence analogous to similar customs surviving in India. The community in its tribal form was the prominent feature, the village of serfs the subordinate; groups of kindred occupying their several homesteads and the lands around; small villages of serfs occupying cottage homes, massed together, and using the lands around them in intermixed or runrig occupation. Thus Mr. Seebohm's formula, defining the English institution as a manor with a village community in serfdom under it, he would rewrite as a tribal community with a village in serfdom under it.

**Villain,** a member of the lowest class of unfree persons under the feudal system; a feudal serf. A villain had in respect of persons other than his lord, all the rights and privileges of a freeman, but in respect of his lord he had no rights, save that the lord might not kill or main him, nor ravish his females. The villain could not acquire or hold any property against his lord's will, and he was obliged to perform all the menial services demanded of him by his lord; the house and land occupied by him were held solely at the will of the lord. Villains were of two classes: (1) Regardant and (2) in gross. The former were annexed to the soil belonging to a manor as a fixture, and passing with it when sold or inherited. They could not be sold or transferred separate from the land. Villains in gross were not annexed to a manor, but belonged personally to their lord, who could sell or transfer them at pleasure. If they ran away or were purloined they might be recovered by action like beasts or other chattels.

**Villard, Henry,** an American capitalist; born in Spire, Germany, April 11, 1835; received a good education; removed to the United States in 1853; and engaged in newspaper work in Chicago. In 1859, as a correspondent for the Cincinnati "Commercial," he was sent to the Colorado gold re-

gion; and during the Civil War was a correspondent in Washington, D. C., for Eastern and Western papers. In 1873, as agent for German stockholders, he bought the Oregon and California railroad and the Oregon Steamship companies. In 1875 with C. S. Greeley he was made receiver of the Kansas Pacific railroad. He next formed the Oregon and Transcontinental Company, which afterward controlled the Oregon Railway and Navigation Company and the Northern Company. In 1881–1884 he was president of the Northern Pacific, and in 1889–1893 was chairman of the board of directors. In 1890 he purchased the Edison Machine Works in Schenectady, N. Y., and the Edison Lamp works in Newark, N. J., and from these organized the Edison General Electric Company, of which he was president for two years. He made liberal donations to charitable, educational, and religious enterprises, and published "The Pike's Peak Gold Regions." He died in Dobbs Ferry, N. Y., Nov. 11, 1900.

**Villari, Pasquale,** an Italian historian; born in Naples, Italy in 1827. His principal works are: "History of Girolamo Savonarola and his Times" (1859–1861); "Niccolo Machiavelli and his Times" (1877–1882); "Ancient Legends and Traditions Illustrating the Divine Comedy" (1865); "Essays Critical, Historical, and Literary" (1868); "Teaching History" (1869); "The School and the Social Question in Italy" (1872).

**Villars, Claude Louis Hector, Duc de,** a French military officer; born in Moulins, France, May 8, 1653. He early distinguished himself under Turenne, Condé, and Luxembourg, and was created maréchal de camp in 1690, and lieutenant-general in 1693. In the wars of the Spanish succession he was sent to coöperate with the Elector of Bavaria. He defeated Prince Louis of Baden at Friedlingen, Oct. 14, 1702, for which he received the marshal's baton; and having joined the elector he defeated the Prince of Baden at Höchstadt, Sept. 21, 1703. His success in dealing with the insurrection of the Camisards obtained for him the title of duke (1705). Having been sent to defend the frontier against Marlborough, he forced the formidable lines of Stollhofen, near Strasburg, and penetrated far into Germany (1705–1707). In 1709 he replaced Vendôme in Flanders, and fought the battle of Malplaquet against Marlborough and Eugene, in which he was seriously wounded. In 1712 he defeated the allies at Denain, took Marchiennes, and relieved Landrecy. After the peace of Utrecht he opposed Eugene with uninterrupted success, and negotiated with him the peace of Rastadt, March 7, 1714. On the renewal of the war with Austria in 1733 he was sent to Italy at the head of an army, with the title of Marshal-General of France. After a successful campaign, he died in Turin, Italy, June 14, 1734.

**Villarsia,** a genus of plants of the natural order *Gentianaceæ,* the species of which are widely distributed over the world, and are either aquatic or marsh plants, with entire leaves and yellow flowers. *V.* (*Limnanthemum*) *nymphæoides* is a native of England, but rare; it is more common in many parts of Europe, from Denmark to the Mediterranean, and is very abundant in Holland, often covering large tracts of the canals with its beautiful flowers and leaves. *V. indica* is regarded as a valuable medicine in India, being given internally to persons bitten by cobra. Several species from South Africa and Australia are cultivated in British aquariums for the beauty of their flowers.

**Villarsite,** an orthorhombic mineral, occuring mostly in rounded grains, with mica, quartz, and magnetite, at Traversella, Piedmont; hardness, 4–5; sp. gr., 2.978–2.99. Color, yellowish- to olive-green; translucent. Composition: Essentially a hydrated silicate of magnesia and protoxide of iron.

**Villebrunea,** in botany, a genus of *Urticaceæ. V. appendiculata* is a small tree, growing in the Northeastern Himalayas, Chittagong, etc. It yields a strong and flexible brown fiber, made into ropes, nets, and coarse cloth in Sikkim and Assam. *V. frutescens,* a shrub or small tree found in the Himalayas, also yields a fiber suitable for fishing lines and nets.

**Villehardouin, Geoffroi de,** a French chronicler; born in the family château near Bar-sur-Aube, about 1160. In 1180 he succeeded his father Guillaume as Marshal of Champagne under Thibaut, brother of Henri II. of France, and in 1201 he was one of the ambassadors dispatched to Venice to make arrangements for the transport of the forces for the fourth crusade. On his return he found Thibaut dangerously ill, and it was soon his duty to act as guardian of the rights of the widowed princess, Blanche of Navarre. Having concluded a treaty in her name with the king, Philippe Auguste, he departed for the East, where he distinguished himself greatly in the conflict which finally placed Baldwin of Flanders on the throne of the Byzantine empire. Rewarded by the new monarch with extensive lands on the Hebrus, and appointed Marshal of Rumania, he repaid the favor by saving the crusaders from disastrous defeat near Adrianople in 1205. On his death in 1213 his nephew Geoffroi inherited his title and possessions. The narrative of the fourth crusade by which Villehardouin ranks among the most important historians of the time, covers the period from 1198–1207, and con-

sists largely of his own personal experience. First published by Blaise de Viginére as "History of the Conquest of Constantinople by the French Barons, associated with the Venetians in the year 1204, in the Change of its Absolute Language to one more Modern and Intelligible" (1584), it has been frequently reëdited by Ducange (1657); by Petitot in his "Collections of Memoirs" (1819); by Bouquet in his "Things Gallic." "Scriptures" (1838); and by Natalis de Wailly (1st. ed. 1871, 2d 1874). There is an English translation by T. Smith, "Chronicles concerning the Conquest of Constantinople" (1829), and a German translation by Todt (1878).

**Villemain, Abel François,** a French author; born in Paris, June 11, 1790. Educated at the Lycée Louis-le-Grand, he was at the age of 20 appointed assistant Professor of Rhetoric at the Lycée Charlemagne, and soon afterward professor at the École Normale. In 1812 he gained the prize of the Academy for his "Eulogy of Montaigne"; on April 21, 1814, he read before the King of Prussia, the Czar Alexander, and the *élite* of Parisian society his essay "The Advantages and Inconveniences of the Critic," and two years after, he was crowned a third time for his "Eulogy of Montesquieu" (Aug. 25, 1816). Already assistant to Guizot in the chair of modern history, Villemain was then appointed Professor of French Eloquence at the Sorbonne, and in a brilliant career of 10 years carried the philosophic spirit that distinguished Cousin in philosophy and Guizot in civil history into the history of French literature. Before the publication of his lectures 1827–1830 he had won a high reputation as a critic by his "Medleys" (1823; new ed. 1860) and "New Medleys" (1827), and as a historian by his "Story of Cromwell" (2 vols. 1819), and the dramatic study "Lascaris, on the Greeks of the Fifteenth Century" (1825). Deputy for Evreux from July, 1829, he was made a peer of France in 1832, and from March 13, 1839, to March 1, 1840, was Minister of Public Instruction. Reappointed on Oct. 20, he was the leading promoter of the banishment of the Jesuits in 1844. About the end of that year ill-health forced him to forbear all mental labor, but in 1847 he had wholly recovered. After the establishment of the empire, Villemain resigned all his appointments save his place in the Academy, to which he had been elected in 1821. He died May 8, 1870.

**Villemarqué, Théodore Hersart Vicomte de la,** a French antiquarian; born in Quimperté in 1815. He was author of "Barzaz-Breiz: Popular Songs of Brittany" (1840); "Popular Tales of the Ancient Bretons" (1856); "Celtic Legends of Ireland, Wales, and Brittany" (1859); "Stories of the Round Table"; "Breton Poems of the Middle Ages," etc. Died 1895.

**Villena, Enrique de Aragon,** commonly styled MARQUES DE, a Spanish poet; born in 1384. He wrote: "The Troubadour's Art"; "The Art of Carving"; "The Labors of Hercules" (1483); "Treatises on Consolation"; "Fascinology" (on the evil eye); "On Leprosy." He also translated the Æneid and the "Divine Comedy." He died in Madrid, Spain, Dec. 15, 1434.

**Villenage,** in feudal law, a tenure of land by base services; the tenure of a villain. It was of two kinds: (1) Pure villenage, where the service was base in its nature and undefined as to time and amount, and (2) privileged villenage (also called villein socage), in which the service, although of a base nature, was certain and defined. When lands held in villenage descended from father to son in uninterrupted succession, the occupiers or villeins became entitled by prescription or custom to hold their lands against the lord, so long as they performed the services required of them under their tenure, and according to the custom of the manor. These customs were preserved and evidenced in the rolls of the several courts-baron in which they were entered or kept on foot by the constant immemorial usage of the several manors in which the lands lay. Tenants holding such lands, having nothing to show as title to their estates but the entries in these rolls or copies of them authenticated by the stewards, came in time to be called tenants by copy of court-roll, and their tenure copyhold.

**Villeneuve, Pierre Charles Jean Baptiste Silvestre de,** a French naval officer; born in 1763; entered the navy in 1777. He led the rear division at the battle of the Nile, and escaped with his own and four other ships to Malta. In 1804 he was made vice-admiral, and in 1805 Napoleon appointed him to the command of the Toulon squadron, with orders to divert the British fleet from the European coasts. He was eventually shut up in Cadiz by Nelson, but with the hope of repairing his ill success by a brilliant victory he sailed out of Cadiz, along with the Spanish fleet under Gravina, and offered the enemy battle off Cape Trafalgar. Villeneuve's flagship, the "Bucentaure," was captured, and the admiral taken as prisoner to England. In April, 1806, he was released and returned to France, but learning that his reception by the emperor would be unfavorable he committed suicide.

**Villeroi, François de Neuville, Duc de,** a French marshal; born April 7, 1644; was educated at court with Louis XIV.; but was banished to Lyons for a love affair. In 1680 he returned to court, and in 1693 became a marshal, having distinguished himself at Neerwinden. As commander in

the Netherlands in 1695–1696 he showed great incapacity; and sent in chief command to Italy in 1701, he was there defeated and taken prisoner by Prince Eugene. Again he commanded in the Netherlands, but was defeated by Marlborough at Ramillies. Madame de Maintenon got him made guardian to Louis XV. Orleans sent him to live on his estate in 1722, because of his intrigues; but he was subsequently governor of Lyons, and died in Paris, July 18, 1730.

**Villers, Charles François Dominique de,** a French historian; born in Boulay, Lorraine, Nov. 4, 1765; left France at the Revolution, and settled in Germany. He wrote: "Kant's Philosophy; or, Fundamental Principals of Transcendental Philosophy" (2 vols. 1802); "An Essay on the Spirit and Influence of Luther's Reformation" (1804); "General View of the Universities" (1808). He died in Göttingen, Germany, Feb. 26, 1815.

**Villiers, Charles Pelham,** an English statesman; born Jan. 3, 1802; was graduated at St. John's College, Cambridge, in 1824; called to the bar in 1827; and elected to Parliament as a Free Trade Liberal in 1834. He represented his constituency for 63 years. In 1838, at the head of 38 Free Traders in Parliament, he led the movement for an investigation of the Corn Laws; in 1840 moved their repeal, and continued to agitate the question year after year till the repeal act was finally passed in 1846. He was elected chairman of the Committee on Public Houses in 1853; opposed vested rights in licenses; brought forward in Parliament the question of postal reform; and was president of the Poor Law Board in 1859–1866. While holding the last office he was instrumental in the passage of the bill making unions chargable for all the poor within their districts. He died in London, England, Jan. 16, 1898.

**Villi,** in anatomy, hairs set closely together, so as to constitute a surface like the pile of velvet. They are most fully developed on the mucous coat of the small intestines. They are really little elevations or processes of the superficial part of the corium. The chorion of the ovum is also densely clothed with villi or vascular processes, which, when fully developed, form the fœtal placenta.

**Villon, François,** true name probably François Montcorbier, a French poet; born in Paris in 1431. He lead a wild, roving life, being imprisoned, pardoned, and finally banished from France. His poetry marks a new epoch in the introduction of a personal element. He wrote: "The Greater Testament" (1456), and the "Smaller Testament: Its Codicil" (1461), both in eight-line stanzas, with ballads and rondeaus interposed; a volume of "Balades"; and a collection of poems in a jargon today unintelligible, "Jargon." He died about 1484.

FRANÇOIS VILLON.

**Vilmar, August Friedrich Christian,** a German theological writer; born in Solz in Lower Hesse. He was Professor of Lutheran Theology at Marburg, and a resolute opponent of rationalism in theology. He wrote: "The Theology of Facts versus the Theology of Rhetoric" (1856); "History of German Civilization in Most Recent Times" (1858–1867); "A Little Handbook for the Friends of the German Folk-Song" (1867); "Exposition of the Augsburg Confession" (1870); "Moral Theology" (1871); "Dogmatic Theology" (1874); "History of German National Literature" (1845; 24th ed. 1894). He died in Marburg, Germany, July 30, 1868.

**Vilna,** or **Wilna,** a town of Russia; capital of the province of the same name; on the Vilia. It is picturesquely situated, and contains numerous churches and convents. It has a governor's palace, a town hall, Greek and Roman Catholic cathedrals, and numerous educational establishments. There is a considerable trade in agricultural produce sent to Baltic ports. Pop. 162,633,- The province, which lies in the Baltic, has an area of 16,181 square miles and a population of 1,861,200. The surface is generally flat, and the province produces good crops of grain, hemp, and flax. Manufactures and trade are limited.

**Vimeira,** a village of Portuguese Estremadura; 3 miles from Torres Vedras. It is remarkable for the battle between Wellington and Junot, fought on Aug. 21, 1808, which was followed by the Convention of Cintra (Aug. 30).

**Vinca,** a genus of *Plumiereæ;* perennial herbs or undershrubs, with evergreen leaves. Flowers solitary, calyx five-partite; corolla salver-shaped, white, blue, or purple, the

segments oblique; follicles two, erect; seeds without seed-down; known species about 10, from Europe, Asia, and Africa. It has procumbent stems (the barren ones not rooting), oblong-lanceolate leaves with glabrous margins, the calyx-teeth also glabrous, the corolla bluish-purple. *V. major*, the greater periwinkle, has a sub-erect stem (the barren ones not rooting), ovate-cordate leaves ciliate on the margin, and is twice the size of the first species.

**Vincennes,** a city and county-seat of Knox co., Ind.; on the Wabash river and on the Cleveland, Cincinnati, Chicago, and St. Louis, the Baltimore and Ohio South Western, the Pennsylvania, and the Evansville and Terre Haute railroads; 110 miles S. W. of Indianapolis. It is the entrepôt of a large agricultural region. Here are a court house, city hall, Vincennes University, the Harrison House, built by Governor Harrison in 1804; St. Francis Xavier Cathedral, an Orphan's Home, St. Vincent's Orphan Asylum for Boys (R. C.), several National banks, a number of daily, weekly, and monthly periodicals, street railroad and electric light plants, and waterworks. The city has machine shops, saw and grist mills, a brewery, sewer pipe works, foundries, and manufactories of wagons, cement, stoves, tile, brick, plaster, wrapping paper, and various articles in tin, iron, and wood, and an assessed property valuation of nearly $5,000,000. A French trading post was established here in 1710, and a colony in 1735, which lived peacefully with the Indians. Till 1813 Vincennes was the capital of the Northwest Territory. Pop. (1890) 8,853; (1900) 10,249; (1910) 14,895.

**Vincennes University,** a coeducational non-sectarian institution in Vincennes, Ind.; founded in 1806; reported at the close of 1901: Professors and instructors, 10; students, 175; volumes in the library, 5,500; income, $7,000; president, James E. Manchester, D. Sc.

**Vincent, Arvède,** a French author; born in Paris, France, Nov. 17, 1840. She wrote: "Essays and Fantasies" (1887); "Princesses and Great Ladies: Maria Mancini, Christina of Sweden, the Duchess of Maine" (1890); "Bernardin de St. Pierre" (1891); "A. de Musset" (1893); etc.

**Vincent, Frank,** an American traveler; born in Brooklyn, N. Y., April 2, 1848. He was educated at Yale University, and was the first man to make a systematic tour of the world covering 355,000 miles. He was a member of many geographical, ethnological, and archæological societies, and he received decorations from the kings of Burma, Cambodia, and Siam. He published "The Land of the White Elephant" (1874); "Though and Through the Tropics" (1876); "Two Months in Burma" (1877); "The Wonderful Ruins of Cambodia" (1878); "Norsk, Lapp, Finn" (1881); "Around and About South America" (1888); and "The Republics of South America" (1889); "In and out of Central America"" (1890); "Actual Africa" (1893); etc.

**Vincent, John Heyl,** an American clergyman; founder of the Chautauqua Assembly; born in Tuscaloosa, Ala., Feb. 23, 1832; was educated at the Wesleyan Institute, and began to preach at 18. He was pastor at Galena, Ill., and Chicago, and in 1865 established the "Sunday-School Quarterly," and in 1866 the "Sunday-School Teacher," which contained the lesson system, since become international. He was general secretary of the Methodist Sunday-School Union, and also of the Tract Society. In 1874, with Lewis Miller, of Akron, O., he established the Chautauqua Assembly, and became superintendent of instruction and chancellor. In 1888 he was elected a bishop of the Methodist Episcopal Church, with residence at Topeka, Kan.; and in 1900 was appointed resident bishop in charge of European work of the Methodist Episcopal Church. Among his published works are: "Little Footprints in Bible Lands" (1861); "The Chautauqua Movement" (1886); "The Home Book" (1886); "The Modern Sunday-School" (1887); "Better Not"; a series of Chautauqua textbooks (1887); "The Church at-Home"; "Outline History of England"; "Outline History of Greece"; etc.

**Vincent, Marvin Richardson,** an American clergyman; born in Poughkeepsie, N. Y., Sept. 11, 1834; was graduated at Columbia College in 1854; and held a number of educational posts; becoming in 1888 Professor of New Testament Criticism at Union Theological Seminary, New York. With Charlton T. Lewis, he translated Johann Albrecht Bengel's "Gnomon of the New Testament" (2 vols. 1860–1862). He afterward published, besides tracts, sermons, and review articles, "Amusement a Force in Christian Training" (1867); "The Two Prodigals" (1876); "Gates into the Psalm Country," a series of descriptions (1878); "Stranger and Guest"; (1879); "Faith and Character" (1880); "The Minister's Handbook" (1882); "Christ as a Teacher" (1886); and "Word Studies in the New Testament" (1887–1900); "That Monster, the Higher Critic" (1894); "The Age of Hildebrand" (1896); "A History of the Textual Criticism of the New Testament" (1899); etc.

**Vincent, St.,** a Spanish martyr; born in Hulsea, Spain; was imprisoned and tor-

tured under Diocletian's reign, dying in Valencia in 304. His day is Jan. 22.

**Vincent, Strong,** an American military officer; born in Waterford, Pa., June 17, 1837; was graduated at Harvard University in 1859, and admitted to the bar in 1860. Soon after the beginning of the Civil War he became lieutenant in the volunteer army; in September, 1861, was commissioned lieutenant-colonel of the 83d Pennsylvania Infantry; in October, 1862, was promoted colonel; and at Fredericksburg conducted a difficult retreat. He especially distinguished himself in the battle of Gettysburg, where he led his brigade up Little Round Top, and aided in checking an attempt of the Confederates to turn the left flank of the Union army. Colonel Vincent was mortally shot while cheering his regiment in the face of a galling fire. He died near Gettysburg, Pa., July 7, 1863.

**Vincent de Paul, St.,** a French philanthropist; born in Ranquines, France, April 24, 1577. After studying in a convent of the Cordeliers, he went to the University of Toulouse, and in 1600 was ordained priest. On a voyage from Marseilles to Narbonne, he was captured by pirates, and sent to Tunis, where he was kept in slavery for two years under three masters, the last of whom he converted to Christianity, and escaped with him to France, in 1607. He soon after settled in Paris, devoting himself to works of charity. He was named almoner to Margaret of Valois, held for a short time the cure of Clichy, and in 1613 became tutor to the sons of Philippe de Gondi, one of whom became afterward celebrated as the Cardinal de Retz. In 1616 he began those labors as missionary which occupied so large a part of his life, and the next year he founded the "Brotherhood of Charity," the model of so many others afterward established. His next great task was the reform of the condition of criminals condemned to the galleys; for which great service he was appointed almoner-general of the galleys. This unwearied philanthropist founded, in 1623, the Congregation of the Mission, which was constituted by royal letters patent, and approved by the Pope. In 1634 he instituted the order of "Sisters of Charity," the most widely known, perhaps, of all his foundations. He attended Louis XIII. on his death bed; was named by the Queen Regent Anne of Austria, president of the Council of Conscience, took part in the controversy between the Jesuits and the Jansenists, against the latter; and died in the convent of the Lazarists, Sept. 27, 1660. He was canonized by Pope Clement XII., in 1737.

**Vincent of Beauvais,** or **Vincentius Bellovacensis,** a mediæval encyclopedist; born about 1190. He was a Dominican friar. His voluminous works cover the whole field of mediæval science. The chief is "The Greater Mirror" (Speculum Majus), a vast encyclopædia of fables, science, literature, etc., in three huge volumes of 80 books and 9,885 chapters; it comprises Natural, Doctrinal, Historical; another part, Moral, is by another hand. Part i. (ed. 1473–1476) contains 848 folio pages, and treats of the whole visible world, and even of the Creator, angels, etc.; part ii., Doctrinal, is a summary of the scholastic philosophy, liberal and useful arts, government, grammar, arithmetic, theology, etc. The third part gives the Bible account of creation, the world's secular history down to Constantine, and histories of the German, Frank, English, and other nations. He died about 1264.

**Vincent of Lerins,** or **Vincentius Lerinensis,** an ecclesiastical writer of the first half of the 5th century; was a native of Gaul and a monk of the monastery of Lerinum (an island, now St. Honorat), opposite Cannes. He was author of a "Warning against the Profane Novelties of all Heretics." In that work is for the first time laid down formally the test of Catholicity of doctrine, which is that the Catholic doctrine is "what everywhere, what always, what by all hath been believed" (*quod ubique, quod semper,* and *quod ab omnibus creditum est*). He is by some critics believed to be also the author of a treatise favoring the heretical opinions of the Semipelagians, which is the subject of Prosper the Aquitanian's "Replies, on behalf of Augustine's Teaching, to the Heads of the Vincentian Objections."

**Vinci, Leonardo da.** See LEONARDO DA VINCI.

**Vincke, Karl Friedrich Gisbert, Freiherr von,** a German poet; born in Hagen, Germany, Sept, 6, 1813. He wrote: "Legends and Pictures of Westphalia" (1856); "Poems" (1860); "Comedies" (2 vols. 1869 and 1881); "A Little List of Sins" (4th ed. 1889); and adapted some of Shakespeare's plays. He died in Freiburg, Baden, Feb. 6, 1892.

**Vindhya Mountains,** a range of hills which extend across Central India, almost due E. and W. from the plateau of Chota Nagpur, overhanging the basin of the Ganges, to the shores of the Arabian Sea in Gujerat. Their total length is about 500 miles, and the highest peak does not exceed 6,000 feet. The formation is granitic overlaid with sandstone. They form on the N. a continuous border to the Nerbudda, and with that river they are regarded as forming the traditional boundary between Hindustan proper on the N. and the Deccan on the S. The "fourfold girdle

round the waist of India" is completed by the Satpura range and the Tapti river.

**Vine,** the *Vitis* of the botanist, is a genus of which there are a number of species; they are found over a wide range of the Northern Hemisphere, the majority in temperate Asia, as well as in North America, but none are found in Europe. The genus belongs to the *vitæa* section of the order *Vitaceæ*. It has pentamerous flowers (five-toothed, five petals, and five stamens); the petals are attached to the disks at the base of the ovary, but, contrary to general rule, they adhere at the top and form a cap, which is thrown off by the stamens as they elongate and expand; the latter adhere for a time to the base of the fruit. All the species are furnished with claspers by which to lay hold for their support on any object within their reach. Some have leaves greatly lobed, others have them nearly plain.

The *V. vinifera*, the European wine-yielding grape vine, is that which has the greatest economic and commercial importance.

VITIS VINIFERA.

It is found on the shores of the Caspian Sea, and it grows wild throughout the lower Caucasus and in Armenia. The cultivation of this plant has occupied much of man's time and attention in all nations that have attained to any degree of civilization, from the very dawn of history, and it is spreading more rapidly at the present time than ever it did at any previous one. The endless variety of grape vines in cultivation seems to indicate that the *V. vinifera* is not a true species, and this view is confirmed by the circumstance that seed taken from any variety of grape does not reproduce the parent, as it should do if it were an unbroken species, but one widely different, and as a rule very inferior to the parent, except in exceedingly rare instances, when a step in advance may take place. The writer has raised hundreds of vines from seeds taken from the finest grapes in cultivation, the rare exception being a variety equal or superior to the parent, and the rule being a reversion to a very inferior type; it is questionable if any of our high-class grapes are to be found in an uncultivated state in any part of the world. The plant has evidently been developed by the ingenuity of man at some very remote date, of which there is no record, just as our apples, plums, pears, peaches, and many other fruits and vegetables have been; and if man's constant care were withdrawn from their cultivation they would soon disappear from the earth, leaving it in possession of their wild progenitors.

By many Persia is thought to be the home of the grape vine, and excellent wine is still made there and exported. In European graves of the Bronze Age grape stones have been found, and in Greece and Italy the culture is primeval. The culture of wine on a commercial scale is dealt with in the article on wine, and in the articles on the wine growing countries. In Europe now the line of open-air culture of the vine on a large scale passes from the country just N. of the Loire in France through Belgium, Central Germany, and Silesia; but in the Middle Ages wine was largely produced N. of this — in North France, Holland, and in England — either because the climate was warmer, or because consumers were content with poorer wine.

The cultivation of the grape vine was introduced into England by the Romans. At the date of the Norman Conquest there is evidence that the vine was pretty extensively cultivated in the S. and S. W. of England for the production of wine till about the middle of the 18th century, when for this purpose its cultivation was given up, and it was grown for dessert purposes against walls and dwelling houses with considerable success, and continues to be so grown up to this date. For this mode of cultivation the Royal Muscadine, Sweetwater, and Black Hamburgh are among the most suitable. All the finer sorts of grapes, such as Frontignans, Muscats, Gros Colman, and many others of the higher classes of grapes, can only be cultivated in Great Britain in hothouses, and at the present date enormous quantities are so cultivated in Great Britain and the Channel Islands, some growers sending from 50 to 100 tons to market annually. This great supply depressed the price of grapes by more than one-half since 1882, very much to the public benefit, for it now recognized that for

man, whether in health or sickness, there is no more wholesome or grateful food than good grapes, acting as they do favorably on every organ of the body.

The soil most suitable for the vine in Great Britain is a good calcareous, wheat soil. Turf taken from such land, stacked in narrow ridges for a winter, may be chopped down in the spring, and if clay is in excess, it should have burned clay or old lime rubbish mixed with it in the proportion of 1 to 10. The best manure for a vine border is one into which finely-ground bones, horn shavings, and other phosphatic manures enter, not forgetting potash. It is well to avoid stable manure, as that very frequently breeds fungi. On the other hand, cow manure sours the soil, and should also be avoided. An authority, while investigating the system of vine culture on the banks of the Rhine, found that growers there confined the cultivation to soil nearly all made up of the scoriæ and debris of the rocks, and avoided soil which in England was found most suitable; but the explanation was that, while the soils in question would grow grapes well, they did not yield wine of the desired bouquet.

The vine is easily propagated in a variety of ways — by layers, by cuttings, by eyes; also by budding, inarching and grafting, as well as by raising from seed. The common method of establishing vineyards for open-air cultivation in grape-growing lands — as in California — is to trench the soil where the land is hard, and to plant young canes at distances of from three to four feet apart, and four to five feet between rows, placing a stake to each young vine for its support. In the second year fruit can be produced, though it is better for the ultimate success of the vineyard not to crop till the third. Another method — more laborious and costly, and showing in greater ultimate advantage — is to put the vine cuttings in "nursery rows," to let them form roots there (as with gooseberry cuttings), and then transplant. Much of the labor required for growing grapes either in the open or under glass is devoted to pruning and training the plants. Various systems of pruning are in use, for securing greater vigor in the plant, to obtain more and better fruit, to keep up a constant supply of fruit-bearing wood, and to maintain the fruit-bearing portion, not on the extreme branches only, but near the ground. Nothing can well be less like the great vines grown under glass than the ordinary vine of a French or German vineyard, the vines being kept to some three or four feet in height, so that the uninitiated thinks rather of a raspberry garden than of a vineyard. In Italy greater luxuriance is allowed, and vines are even trained on trees pruned for the purpose.

The vine is very fruitful, and would soon exhaust itself by over-production; hence the clusters have to be carefully thinned. The extent to which thinning is necessary depends on the strength and size of the plant. The berries on the clusters also usually require thinning, according to circumstances; thus a cluster of Black Hamburgh with 120 berries may with advantage be reduced to half the number. The vines most suitable for cultivation under glass for early forcing, so as to give ripe grapes in June, are the Black Hamburgh, Buckland's Sweetwater, Foster's White Seedling, and Royal Muscadine. Those who desire to have grapes of the very highest flavor should plant the Frontignans — black, white, or grizzly, the Muscat of Alexandria, Black Muscat, and Duke of Buccleuch. For a late house to yield grapes all winter and into the spring, the following sorts may be planted: Black Alicante, Gros Colman, Lady Downes, and Mrs. Pince.

Of vine diseases, some are caused by insects, beetles, weevils, caterpillars and larvæ of various kinds; of these the most destructive is the phylloxera; of various fungoid diseases, oidium has been most harmful.

The great Hampton Court vine, planted in 1769, fills a house 66 feet long by 30 wide, and bears annually as many as 1,700 small bunches (Black Hamburgh). Nearly twice the size is the vine at Cumberland Lodge, Windsor Park, which produces a crop of 2,000 bunches, averaging three-quarters of a pound each. The Breadalbane vine in Perthshire covers a house 172 feet long by 25 broad. At the international exhibition of the Royal Caledonian Horticultural Society in 1875 a single bunch of the Raisin de Calabria was shown, weighing 26 pounds 4 ounces; and at the same exhibition was shown a cluster of White Nice only a few ounces lighter. These are coarse varieties of grapes, it is true; but at the Belfast Exhibition in 1874 a bunch of the Black Hamburgh was shown which weighed 21 pounds 12 ounces, and this is a grape of high quality.

In the United States, especially California, the development of viticulture has been great and rapid. Early attempts were made to grow foreign grapes in the open air, but none of these met with success E. of the Rocky Mountains. Till the Californian grape industry developed, the growing of foreign grapes in the United States was under glass, and for dessert purposes. Four native American vines (of some 10 found wild) are used for wine making, the most important being *V. Lambrusca*. In 1890 there were 400,000 acres under vines, three-fourths of which were producing wine, and the total produce was about 40,000,000 gallons. In California alone the acreage of

vines was 150,000 acres, seven-eighths or which were devoted to wine. American vine-stocks, as being less liable to suffer from the phylloxera, have with advantage been introduced into France for grafting on. See WINE.

**Vine Disease,** in vegetable pathology, any disease attacking the vine, specifically: (1) That produced by the attacks of *Oidium tuckeri.* In general it forms a white and very delicate cottony layer upon the leaves, young shoots, and young grapes of the vine, which soon causes them to be covered by brown spots, and then become first indurated and finally destroyed. The fruit becomes abortive, or dwarfed and juiceless, and decay follows. There is a predisposition to the disease in certain states of the atmosphere. It first broke out in Kent, England, in 1845, whence it spread to the continent of Europe, to Madeira, and to the English vines introduced into America, though American vines themselves escaped. Soon after its appearance, Mr. Tucker, a gardener at Margate, England, was the first to try sulphur as a remedy. It is still the best known, and the fungus has been named after its human destroyer.

(2) A disease of the vine produced by an aphis, *Phylloxera vastatrix.* The parasites cause the roots to swell, and finally to be incapable of discharging their functions, so that the plant wastes away or perishes. They are as difficult to destroy as other aphides.

**Vine Fungus,** in botany, the *Oidium tuckeri,* a naked-spored mold which attacks the vine.

**Vinegar,** a solution of acetic acid, usually containing from 2 to 5 per cent. of acid, and minute proportions of various ethers and other substances according to the sources whence it is derived. It is a product of the oxidation of alcoholic solutions, and may consequently be prepared from any body containing alcohol, or capable of being transformed into that substance. In practice it is prepared from malted barley or other grain (malt vinegar), from wine of inferior quality (wine, French or Orleans vinegar), from dilute solution of spirit (spirit vinegar), and from cider (cider vinegar). Wood vinegar, a product of the destructive distillation of wood, is used chiefly in connection with chemical operations, and though deficient in flavor, and other qualities it is in extensive use as a table vinegar, and for the various other purposes to which common vinegar is usually applied. The circumstances which are necessary for and favor the production of vinegar are, (1) an alcoholic solution (or a solution capable of developing alcohol) containing not more than 10 per cent. of spirit; (2) a suitable temperature, which may range from about 45° to 100° F.; (3) free access of atmospheric air; and, (4) the presence of substances which promote acetification or oxidation of the alcoholic solution, the chief active agency being the vinegar fungus *Mycoderma aceti,* which acts as a carrier of oxygen to the solution.

There are two principal processes by which ordinary vinegar is prepared, termed respectively, (1) the old or slow process; and (2) the quick process. The slow process is still largely used in the preparation of French or wine vinegar, and it is also used in making British malt vinegar. In the manufacture of the latter there are a number of preliminary operations analogous to those employed in brewing. A mash of mixed malt and unmalted barley is prepared, and the wort is permitted to ferment. After completion of the fermentation the liquor is run into barrels, the tops of which are open but tied over with coarse canvas, and stored away in darkened but moderately-heated chambers where there is free access of air. There the acetous fermentation takes place slowly during several weeks or even months, when the contents of the barrels are emptied into two large tuns having false bottoms, over which the pressed cake from making currant wine, etc., is strewed. One of the tanks is filled entirely, but the second is only three-fourths filled. Here the acetous fermentation proceeds vigorously, and when the vinegar is ready a portion is drawn from the second (unfilled) tun. The quantity withdrawn is made up from the full tun, and it again is filled up from the barrels. In this way the manufacture goes on progressively. The old or slow method of vinegar making is a system requiring extensive premises and plant, and to a large extent it is now supplanted by the new or quick process.

The principal on which the various quick methods in operation depend consists in exposing the alcoholic solution at a favorable temperature in the most intimate manner to the action of the atmosphere. The solution is made to trickle drop by drop through one or more columns containing beech shavings or other means of fully exposing the fluid to the air, and as it descends it meets a current of air ascending. In this way rapid and complete oxidation is promoted. Vinegar on domestic scale is prepared from saccharine solutions to which the vinegar fungus *Mycoderma aceti* is added, the solution being covered up and kept in a warm place till the acetification is complete. The use of vinegar in the manufacture of pickles, the preparation of salads, and of acid beverages, as well as directly as a sauce with animal food, is very extensive. It is also an important

substance in medicine, both for internal and external use, and its pungency combines in a very refreshing manner with various perfumes for toilet purposes. Vinegar is a valuable aid to the digestion of the hard fibrinous and albuminous constituents of food. The qualities of vinegar depend principally on the source whence it is obtained, the best being wine vinegar, after which comes that prepared from pure malt. Inferior vinegar is frequently contaminated with sulphuric acid, of which by law one part per thousand is permitted to be present without being counted an adulteration.

**Vinegar Bible,** a Bible printed 1717 at the Clarendon Press in Oxford. So named because in the running headline of Luke xxii. vineyard was misprinted vinegar.

**Vinegar Eel,** the *Anguillula aceti,* a small species of nematoid worm, inhabiting vinegar. It is one of the "free" or non-parasitic nematoids. The young are produced in large numbers, and frequently by a process analogous to asexual methods of reproduction.

**Vinegar Hill,** an elevation 389 feet high, close to the town of Enniscorthy, in County Wexford, Ireland; scene of the complete defeat of the Irish by General Lake, June 21, 1798. They had held their camp here for about a month, and disgraced their cause by ruffianly outrages on the lives and property of the loyalists in the surrounding country. About 400 of the Irish were cut down, the remainder fled in headlong rout to Wexford, whither Lake marched the day after, killing all whom he found with arms.

**Vinegar Plant,** a peculiar state of the *Penicillium glaucum,* a fungus found on decaying substances, and in fluids in a state of acetification. It forms a flocculent mass, which is tough and crust-like or leathery. A small piece of this when immersed in a mixture of sugar or treacle and water produces a rather insipid kind of vinegar.

**Vineland,** a borough in Cumberland co., N. J.; on the West Jersey and the Central of New Jersey railroads; 12 miles E. of Bridgeton. It is built on a level and sandy tract in a notable fruit-growing region. Here are numerous churches, hotels, a high school, public library, National and State banks, and several daily, weekly and monthly periodicals. The borough has machine shops, flour mills, and manufactories of shoes, carriages, fruit crates, buttons, gloves, clothing, paper boxes, linoleum, chenille curtains, carriages, plows and Smyrna rugs. Pop. (1890) 3,822; (1900) 4,370.

**Vinet, Alexandre Rodolphe,** a Swiss theologian; born in Lausanne, Switzerland, June 17, 1797. In 1817 he was appointed Professor of the French Language and Literature at the Basel Gymnasium, in 1835 at the Basel University, and in 1837 accepted the chair of theology in the academy at Lausanne. In 1840 he seceded from the National Church, maintaining that there should be no connection between Church and State. His views on this subject were enforced in his "Essay on the Manifestation of Religious Convictions, and on the Separation of Church and State" (1842). In 1845 he gave up his chair. He was an earnest and eloquent preacher, and wrote "History of French Literature in the 18th Century"; "Studies of French Literature in the 19th Century"; etc. He died in Clarens, on Lake Geneva, May 4, 1847.

**Vinland,** the name given to the chief settlement of the early Norsemen in North America. It is undoubtedly represented in modern times by part of Massachusetts and Rhode Island. The first that saw it was Bjarne Herjulfson, who was driven thither by a storm in the summer of A. D. 986, when making a voyage from Iceland to Greenland, of which country his father, Herjulf, and Eric the Red, were the earliest colonists. But Bjarne did not touch the land, which was first visited by Leif the Lucky, a son of Eric the Red, about A. D. 1000. One part of the country he named Helluland ("Stoneland"); another Markland ("Woodland"), the modern Newfoundland and Nova Scotia; a German in his company having found the grape (most probaly the *Vitus vulpina*) growing wild, as in his native country, Leif called the region Vinland. The natives from their dwarfish size they called skraelings. Two years after Leif's brother, Thorwald, arrived, and in the summer of 1003 led an expedition along the coast of New England S., but was killed the year following in an encounter with the natives. The most famous of the Norse explorers, however, was Thorfinn Karlsefne, an Icelander, who had married Gudrid, widow of Thorstein, a son of Eric the Red, and who in 1007 sailed from Greenland to Vinland with a crew of 160 men, where he remained for three years, and then returned, after which no further attempts at colonization were made. Rafn, in his "Antiquitates Americanæ," published the first full collection of the evidence which proves the pre-Columbian colonization of America. Both he and Finn Magnusen labor to show that Columbus derived his first hints of a new world from the accounts of these old Icelandic expeditions. Finn Magnusen is believed to have established the fact that Columbus did visit Iceland in 1477, 15 years before he undertook his expedition across the Atlantic, and so may have heard something of the long-abandoned Vinland.

**Vinton,** a city and county-seat of Benton co., Iowa; on the Red Cedar river and on the Burlington, Cedar Rapids, and Northern railroad, 25 miles N. W. of Cedar Rapids. Situated in a fine agricultural region, it is a center of thriving industry. Besides its interest in farming and stock-raising, the city has manufactures of pearl-buttons, bricks, flour, etc., and its creameries and canning factories add to its business activities. It is the seat of the Iowa College for the Blind and of the Tilford Collegiate Academy. Pop. (1900) 3,499.

**Vinton, Alexander Hamilton,** an American clergyman of the Protestant Episcopal Church; born in Brooklyn, N. Y., March 30, 1852. He was graduated at Saint Stephen's College, Annandale, N. Y., in 1873, and at the General Theological Seminary, New York city, in 1876; studied at the University of Leipsic; took orders in 1877, and from 1879 to 1884 was in charge of the Memorial Church of the Holy Comforter, Philadelphia. From 1884 to 1902 he was rector of All Saints' Church, Worcester, Mass., and in 1902 was consecrated first bishop of the diocese of Western Massachusetts. He died Jan. 18, 1911.

**Vinton, Arthur Dudley,** an American lawyer and novelist; born in Brooklyn, N. Y., Dec. 23, 1852; was graduated at the Columbia Law School in 1873. With two others he established a law firm in New York. He was the inventor of the automatic railroad signal patented in 1898, and was for a time managing editor of the "North American Review." He wrote: "The Pomfret Mystery" (1886); "The Unpardonable Sin" (1888); "Looking Further Backward" (1898); etc. He died in 1906.

**Vinton, Francis,** an American clergyman; born in Providence, R. I., Aug. 20, 1809; was graduated at West Point in 1830; served against the Indians in Georgia and Alabama; was thanked by Congress, and received a grant of land in Indiana. He resigned from the army in 1836, and studied at the General Theological Seminary; was ordained in the Protestant Episcopal Church in 1839; rector of several large churches, then of Trinity Church, New York city, 1855-1872. He became Professor of Ecclesiastical Law and Polity at the General Theological Seminary in 1869. His publications include: "Arthur Tremaine, or Annals of Cadet Life" (1830); "Evidences of Christianity" (1855); "Oration on the Annals of Rhode Island and Providence Plantation" (1863); "Manual Commentary on the General Canon of the Protestant Episcopal Church" (1870); etc. He died Sept. 29, 1872.

**Vinton, David Hamilton,** an American military officer; born in Providence, R. I., May 4, 1803; and was graduated at West Point in 1822, and in 1837 became quartermaster-general of Florida. In the Mexican War he served as chief quartermaster with the rank of major, and in 1852-1856 was chief quartermaster of the department of the West. From 1857 to 1861 he held the same position in Texas, and through the Civil War he served as deputy quartermaster-general at New York. In 1866 he was retired, having reached the rank of brevet major-general. He died Feb. 21, 1873.

**Vinton, Francis Laurens,** an American military officer; born in Fort Preble, Me., June 1, 1835; was graduated at the United States Military Academy in 1856, assigned to the 8th Cavalry; but resigned in September; studied metallurgy; and was graduated at the Imperial School of Mines in Paris. When the Civil War broke out he became a captain in the 16th United States Infantry, and later was made colonel of the 43d New York Volunteers. He participated in the Peninsular campaign; was wounded at the action before Fredericksburg; promoted Brigadier-General of volunteers in March, 1863; and was forced to resign in the following May owing to his wound. He was Professor of Engineering in Columbia College in 1864-1877. He died in Leadville, Col., Oct. 6, 1879.

**Vinton, John Adams,** an American clergyman; born in Boston, Mass., Feb. 5, 1801; was graduated at Dartmouth College in 1828 and at the Andover Theological Seminary in 1831; and was ordained in the Congregational Church in 1832. His early ministry was with churches in Vermont, Maine, and Massachusetts. He then became agent of the American Society for Improving the Condition of the Jews. In 1859-1860 he was chaplain of the Massachusetts State Almshouse. Subsequently he turned his attention to genealogical studies. His publications include "Deborah Sampson, the Female Soldier of the Revolution." He died in Winchester, Mass., Nov. 13, 1877.

**Vinyl Alcohol,** $C_2H_4O=\frac{C_2H_3}{HO}$; the name applied to the pungent liquid supposed to be the first member of the allyl series of alcohols, and obtained by agitating acetylene, $C_2H_8$, with sulphuric acid, and distilling. It has since been shown to correspond with crotonic aldehyde.

**Vinyl Chloride,** $C_2H_3Cl$; a gas having an alliaceous odor, and liquefying at 18°. It is obtained by first forming ethene chloride, $C_2H_4Cl_2$, and then treating it with silver oxide, $2C_2H_4Cl_2+Ag_2O=2C_2H_3Cl+2AgCl+H_2O$. The bromide and iodide are similarly formed.

**Viol,** in music, a stringed instrument a little larger than the violin; it was furnished with five or six strings, had a fretted finger board, and was played with a bow. The viol is found depicted in MSS. as early as the 11th century. In France, Germany,

and Italy the number of the strings varied between three and six. It is supposed that they were turned in fourths and thirds. A chest of viols consisted of six instruments of various sizes, the smaller ones were called treble, the next mean, and the larger bass viols: The treble viol was somewhat larger than the violin, and the music for it was written in the treble clef; the mean (or tenor) viol was about the same length and breadth as the modern tenor violin, but was thicker in the body; its music was written in the C clef. The bass viol was much about the same size as the violoncello, and the music for it was written in the bass clef.

**Viola di Bardone,** in music, an instrument of the violin kind, strung with six or seven catgut strings, C, B, G, D, A, E, C. Beneath the gut were metal strings varying in number from 16 to as many as 44, arranged in a diatonic order. The sympathetic strings were occasionally plucked with the left hand in playing. The instrument is now obsolete. It was also called *viola di fagatto, viola bastarda,* and baritone.

**Violan,** in mineralogy, a member of the group of pyroxenes, occurring mostly massive or fibrous, though crystals are occasionally met with. Color, dark violet-blue. Found in small seams with various other minerals in the braunite of San Marcel, Val d'Aosta, Piedmont.

**Violantin,** in chemistry, $C_8H_6N_6O_3$; a compound obtained by heating hydurilic acid with dilute nitric acid. It separates as a yellowish-white crystalline mass, and contains the elements of violuric and dilituric acids, and is resolved into these two acids by simple treatment with water. Vapor of ammonia colors violantin blue.

**Viola Pomposa,** in music, a species of viol da gamba, invented by John Sebastian Bach. It had five strings; the four lower strings were tuned in fifths, and the fifth string was tuned to E, by means of which greater facility in the execution of extended passages was possible.

**Violated Treaty, City of the.** See CITY OF THE VIOLATED TREATY.

**Violenic Acid,** a colorless acid, extracted from the flowers of the violet. It crystallizes in silky needles, soluble in water, alcohol, and ether, and forms yellowish salts, which stain the skin.

**Violet,** in botany, the typical genus of *Violeæ*. Low herbs, more rarely shrubs, with radical or alternate leaves or flowers; on one, rarely on two-flowered peduncles; calyx of five sepals, extended at the base; petals five, unequal, the under one spurred at the base; anthers connate, two of them spurred behind; capsule of three elastic valves; seeds ovoid or globose. Known species 100; from temperate countries. Five of the most familiar are native in temperate



Europe and America: *Viola palustris,* the marsh; *V. odorata,* the sweet; *V. hirta,* the hairy; *V. canina,* Gerard's or the dog violet; and *V. tricolor,* the pansy violet, pansy, or heart's-ease. The first has a subterranean creeping rootstock, glabrous stems, reniform cordate leaves, and white or lilac scentless flowers. The second has broadly cordate leaves, and fragrant blue, white, or reddish purple flowers; found in woods, pastures, or on banks. The third, with faintly scented flowers, is found chiefly in the E. of England and Scotland, and parts of North America. The fourth, with

VIOLETS.

a, sweet violet; b, fancy pansy; and c, bedding viola.

broadly cordate leaves, ciliate dentate stipules, and blue, lilac, gray, or white flowers, is common in woods, dry pastures, clefts of rocks, and banks; and the fifth, having flowers variegated, purple, white, and yellow, is frequent on banks and in fields. The bruised leaves of *V. tricolor* smell like peach kernels; they were once believed to be efficacious in the cure of skin diseases. The petals of *V. odorata* are used as a laxative for children. The seeds have similar qualities, and the root is emetic and purgative. *V. ovata* is a reputed antidote to the poison of the rattlesnake. *V. serpens,* a small, procumbent, Himalayan herb, yields an oil. The flowers are considered diaphoretic and laxative, the seeds diuretic and emetic.

**Violet Crown, City of the.** See CITY OF THE VIOLET CROWN.

**Violet Stones,** stones found on certain mountains, as on the Brocken and the Riesengebirge, which, in consequence of being covered with violet moss, emit a smell like that of violets. Violet moss (*Chroolepus Iolithus*) consists of simple articulated threads, and spreads over the stones in the form of a delicate incrustation.

**Violin** (diminutive from viol), the smallest but most important of the stringed musical instruments played with the bow. Like other bow instruments now in use, it consists of a wooden sonorous chest, formed of two slightly arched surfaces, known as the back and belly, united by sides or ribs, and with a curve or hollow on each side in the middle of the length; a neck or fingerboard attached to the chest; and strings

fastened at one end to the belly by a tail-piece or projection of wood, and at the other by turning pins at the head or extremity of the neck, by which they can be tightened or loosened at pleasure. The strings thus passing over the belly are raised up from it by a bridge, which is supported in the interior by the sound post; and on the belly there are two sound-holes opposite each other, of a form resembling the letter *f*, or rather the long *ſ*. The sounds are produced by drawing a bow across the strings, the upper surface of the bridge being convexly curved, so as to enable the bow to be drawn along each string separately, without coming in contact with the rest. The modern violin has four strings of gut, the lowest covered with fine silvered copper wire, or sometimes, in the best instruments, with silver or even gold wire. These strings are tuned in fifths, the highest or first string sounding E on the fourth space of the treble clef, and the other three the A, D, and G in succession below. The bow, made of horsehair, is held in the right hand, and the sounds of each string, other than the open notes, are obtained by stopping — *i.e.*, pressing it with the finger against the fingerboard at certain distances, thus shortening the vibrating portion, and raising the pitch of the sound. Very high notes are produced by the harmonics of the string, which, instead of being pressed against the fingerboard, is touched lightly, the sound resulting from the vibration being not, as in ordinary cases, of the part of the string between the point of stopping and the bridge, but of a harmonic section of it. A peculiar modification of tone is produced by the application of the mute, or sordino, a little instrument placed on the bridge. A violin or other bow instrument is occasionally played pizzicato — *i. e.*, with the fingers, as a harp or guitar. The compass of the violin is about three octaves and a half, from G below the treble clef to C above the fifth leger line above it, with all the intermediate chromatic intervals; but the highest notes are apt to be harsh and squeaking. Great players command a few notes higher, chiefly by harmonics. Though chiefly an instrument of melody, it is to a limited extent capable of harmony by double stops — two notes may be struck together, and three or four notes may be played in arpeggio. No instrument can compare with the violin in power of expression and execution. It has an unlimited command over a very wide range of sounds, to which any degree of piano and forte, of staccato and legato, can be imparted. In orchestral music there are always two different violin parts known as first and second violin (see ORCHESTRA); and the same is generally the case when the violin is used in concerted music, the usual arrangement of stringed quartet music being for two violins, viola, and violoncello.

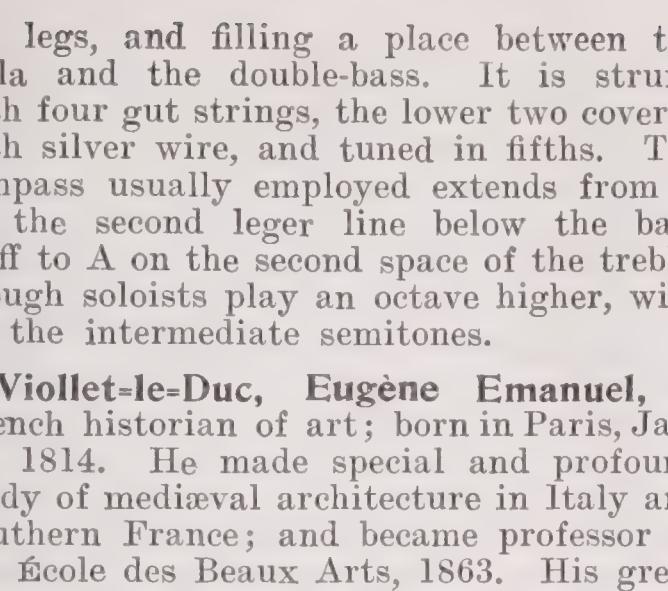
The origin of the violin has been variously traced. The generally accepted view derives it from the one-stringed ravanastron, the simplest of the numerous Oriental stringed instruments played with a bow, which is traditionally the invention of Ravana, King of Ceylon, 5000 B. C., and is still played by Buddhist begging monks. From India these instruments of varied form found their way, through Persia, Arabia, and Spain, to the rest of Europe about the close of the 11th century. The French *rebeck*, resembling the Oriental *rebab*, is the type of them, and from it sprang the viol, the immediate precursor of the violin. Another account derives the violin from the classic lyre, as well as the *crwth* of the Welsh, which was latterly played with a bow. It is not impossible that both theories may be correct. The bow has not been conclusively accounted for, being variously supposed to have been primarily a military bow, a plectrum, and a second monochord lute applied to the first. The earliest violins seem to have been those of Gasparo di Salò in Lombardy (1560–1610), one of whose violins at one time belonged to Ole Bull. Those of Maggini, probably his pupil, are still highly prized. During the 17th century the family of the Amati, at Cremona, including Andrew, his sons Jerome and Antonio, and Nicolo, son to Jerome, produced violins the wonder of succeeding times, whose tone and quality more recent makers have in vain sought to equal. Antonio Stradivari (1649–1737), also of Cremona, pupil of Nicolo, if possible surpassed the Amati, and for a time the repute of Cremona was kept up by the families of the Guarnieri and Ruggieri. Next to the Cremonese violins, in the estimation of connoisseurs, stands those of the Tyrolese makers, Jakob Stainer (1621–1683), and Matthias Klotz and his sons. Villaume of Paris and Gemunde (father and son) of New York city were the most celebrated modern makers. Experience has shown that the minutest details of form and proportion, and the material of which each separate part is made, are matters of vital importance to the quality of the violin. The great makers seem by a succession of delicate experiments and observations to have attained to acoustical qualities of high perfection, which their careful workmanship and extreme dexterity enabled them in all cases unfailingly to reproduce. The prices of the best violins of Stradivari and Guarnieri del Gesù range from $1,000 to $2,500, but several have exceeded the latter figure; one was sold at Stuttgart a few years ago at the fancy price of $10,250.

**Violincello,** a bow instrument of the viol class, held by the performer between

the legs, and filling a place between the viola and the double-bass. It is strung with four gut strings, the lower two covered with silver wire, and tuned in fifths. The compass usually employed extends from C on the second leger line below the bass staff to A on the second space of the treble, though soloists play an octave higher, with all the intermediate semitones.

**Viollet-le-Duc, Eugène Emanuel,** a French historian of art; born in Paris, Jan. 27, 1814. He made special and profound study of mediæval architecture in Italy and Southern France; and became professor in the École des Beaux Arts, 1863. His great work is "Dictionary of French Architecture from the 11th to the 16th Century" (10 vols. 1854–1869). His other chief works are: "Essay on the Military Architecture of the Middle Ages" (1854); "Dictionary of French House Furniture from the Carlovingian Epoch to the Renaissance" (6 vols. 1854–1875); "Discourses on Architecture" (2 vols. 1858–1872); "Chapels of Notre Dame de Paris" (1867–1869); "Memoir on the Defense of Paris" (1872); "History of a House," "History of a Fortress," "History of Human Dwelling Places," "History of a City Mansion and of a Cathedral" (4 vols. 1873–1778). He died Sept. 17, 1879.

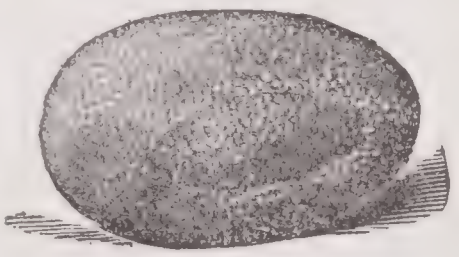
**Viper,** a genus of venomous snakes, representative of the family *Viperidæ*. This family includes many important forms—



COMMON VIPERS.

*e. g.*, the common adder (*Vipera* or *Pelias berus*); the asp (*V. aspis*), extending as far N. as Sweden; the African horned viper (*V. cerastes*) and puff adder (*Clotho* or *Echidna arietans*); the Indian daboia or Russell's viper (*Daboia russellii*); and the Indian *Echis carinata*. The head is relatively broad, somewhat triangular, and generally covered with scales; the eye has a vertical pupil, and there is no pit between it and the nostril; the maxilla bears on each side one functional fang, usually with several reserve fangs beside it; the poison is virulent. The vipers are widely distributed through Europe and Australia; the majority are African. As far as is known they are viviparous.

The common viper or adder is the only poisonous snake indigenous to Great Britain. It lives especially on dry heaths and waste places, often among stones and brushwood; it is commoner in Scotland than in England, and does not occur in Ireland. It is widely distributed throughout Europe. Often confused with the innocent grass snake (*Tropedonotus natrix*), it may be distinguished by its markings. It has two diverging marks between and rather behind the eyes, a spot on each side of the hinder part of the head, a row of confluent rhomboidal spots running zigzag along the upper surface the whole length of the body and tail, and a row of small irregular, almost black, triangular spots on each side. The under parts are of a lead color. The characteristic markings are almost invariable; but the ground color varies considerably, from nearly olive, rich deep brown, or brownish-yellow, to almost black. Thus in some parts of England a black viper is occasionally met with; its ground color a rich black, and the markings of a more intense black than the rest. There is also the "red" and the "blue-bellied," and an almost white viper, with black markings. The viper seldom exceeds two feet in length. It feeds on mice, frogs, small birds, and other small animals, which are killed by its poison fangs, and swallowed entire. It hibernates during several months of the year, and several may then be found twined together in a torpid state. It is a good swimmer, and may occasionally be seen on lakes, such as Loch Lomond, crossing from one island to another. The young are produced in early summer, from 10 to 15 or more at a birth. The eggs have soft, thin envelopes, and are hatched within the oviduct. The young viper is coiled up so closely in the egg as to appear almost a solid mass, but the moment it is set free it is active, and ready to throw itself at once into an attitude of defense.



POSITION OF VIPER IN EGG.

It has often been alleged that in times of danger the young of the viper seek refuge in their mother's open mouth, and find temporary protection in her œsophagus; but, though this unlikely habit is not impossible, the fact is not supported by sufficient evidence. The viper is naturally shy of man, but when trod on or provoked is ready to defend itself by biting. The bite is painful, and, though not dangerous to healthy adults, is apt to be attended with

more serious consequences in the case of children or those of weak constitution. Fatal cases are exceedingly rare. See SNAKE.

**Viper's Bugloss,** a genus of plants of the natural order *Borragineæ*, having a calyx with five deep segments, an almost bell-shaped corolla, with dilated throat, and irregular limb, very long unequal filaments, and a bifid style. The species are large herbaceous plants or shrubs, rough with tubercles and hairs. Their flowers are often very beautiful. The common viper's bugloss (*E. vulgare*), a large annual plant, is a native of Great Britain and of most parts of Europe, growing in dry places, not infrequently in cornfields. Its flowers are at first reddish, and afterward blue. It derives its name, viper's bugloss, from spots on its stem, which somewhat resemble those of the viper. and the property of healing viper's bites was therefore ascribed to it. Other herbaceous species are found in the S. of Europe, North and South America, and other parts of the world. Shrubby species are found chiefly in the Canaries and South Africa.

VIPER'S BUGLOSS: ECHIUM VULGARE.

**Virchow, Rudolf,** a German pathologist. The history of Professor Virchow's life, from his birth in 1821, as the son of a small shopkeeper and farmer in the village of Schivelbein, in Pomerania, has frequently been narrated. Till the age of 13 he was educated at the Volkschule of his native village; at 17 he passed his "departing examination" at the Gymnasium of Köslin, and immediately afterward proceeded to Berlin to study medicine. He graduated as doctor in 1843 and became assistant professor at the Berlin Charity Hospital. In the spring of 1848 he was the junior member of a government commission sent to investigate an epidemic of typhus caused by famine among the hand-loom weavers of the Silesian highlands, and the result of his studies which he embodied in a brilliant and forceful report, gave a permanent direction both to his scientific and to his political career.

Before undertaking this task, he had been appointed in 1847 a regular lecturer in the University of Berlin, and in the same year had founded, together with Dr. Reinhardt his invaluable "Archives of Pathological Anatomy and Physiology and of Clinical Medicine" which has been published ever since. His radical views during the stirring revolutionary times of 1848-1849 led to his expulsion from his Berlin chair. Accepting a call from the University of Würzburg, he did there some of the most remarkable work of his life, and with a coterie of brilliant fellow teachers soon raised the little university into the front rank of medical schools. In 1856 the University of Berlin recalled him to a full professorship, and, despite his intense interest in politics, he carried on his studies and his teachings without cessation from that time till within six months of his death. His greatest discovery was made at Würzburg where he first laid down the theory of the cellular nature of animal tissue, and it was his book, entitled "Cellular Pathology," which not only established his reputation throughout Germany, but made his name respected and honored throughout the entire world. Taking the place of the former vague views of vitality, this theory formed the basis for a new science of physiology.

After this great achievement Professor Virchow made one discovery after another. Never a practitioner himself, he was eminently a teacher of physicians. To these, in later years, the rise and development of bacteriology seemed at first to be in conflict with Virchow's cellular system. The entire medical profession now understands that, while bacteria may cause disease, the disease itself is a particular state of the cells of which the human organism is composed.

But the range of his investigations and discoveries was never confined to any one line or field. Our knowledge of tumors, of tuberculosis, of diphtheria, of embolism, and of the brain, is very largely what Virchow has made it. Indeed, a medical authority has recently declared that "if we should expunge all that medicine as a science directly and indirectly owes to him, comparatively little would be left." "With him," it continues, "begins the scientific era in the healing art, and it is he who has made us the coequals and the copartners of all strivers in the realm of science." Between 1848 and 1879 he wrote voluminously on subjects connected with public hygiene, the reform of medicine, epidemics and endemics, statistics of morbidity and mortality, hospitals, military medicine, school hygiene, criminal law, forensic medicine, and the cleaning of cities. At the same time he kept on publishing his writings on special subjects, such as "Inflammation of Blood-Vessels," "Contributions to the Pathology of the Skull and Brain," "Cranial Deformities," "New Formation of Gray Cerebral Substance," "Cretinism," etc. In the use of his special knife which he named "the

Virchow

pathologist's sword," in the operating room, he displayed an accuracy and skill that were the wonder of beholders.

But, aside from the field of medicine, this great man displayed a versatility that gave point to the popular saying about him in Berlin, that "when he died it would be found that he was not one man but four men." He rapidly made himself, while still young, an authority in ethnology, a pioneer in anthropology, an able archæologist, and a leading Egyptologist. He established the measurements for comparative anthropology and collected race data as no other man had ever done. The discoveries at Troy were due as much to his knowledge and encouragement as to Schliemann himself, whose stanch friend and invariable defender Virchow was. With Schliemann he traveled through Nubia, Egypt, and the Peloponnesus. In 1879 he took part in Schliemann's excavations in Hissarlik. The graves of Koban he described in 1883, and similarly valuable works in archæology appeared in 1880 and 1882. He was for years one of the teachers of the Berlin Association of Artisans, and devoted no little of his precious time to the spreading of the knowledge of nature among the poor. As a linguist, Virchow was a marvel to scientific men. At nearly all international conferences he was able to address the great audiences that came to hear him in their own languages During the wars with Austria and France he was an officer of the army aid societies in Berlin, and conducted the first sanitary trains into the enemies' territory.

Such an extraordinary record of achievement would seem to have been all that was possible for one man even in four-score years of intense scientific application. Not so with Virchow. In the midst of his manifold scientific researches he found time to interest himself deeply in public affairs. The failure of the liberal movement of 1848 and 1849 did not lead him to abandon his country. In 1859 he became a city councilor of Berlin, a position which he held and never neglected for more than 42 years. He was elected to the Prussian Chamber as one of the Freisinnig or Radical party in 1862, and served in that body continuously till his death. In this Chamber he was for 25 years chairman of the Committee on Finance, and to a very great extent he himself laid the foundation of the present constitutional budget system of Prussia, just as he is also responsible for the German laws in relation to fishing which he drew up or inspired when at the head of the German Fishing Association. From 1880 to 1893 he was, in addition to his other activities, a member of the Reichstag, in which he represented a Berlin constituency till ousted by the Social Democrats — a characteristically stupid performance, in view of the enormous benefits which Professor Virchow had conferred on mankind in general and his countrymen in particular, and in view of his liberal political opinions. It was chiefly owing to him that Berlin has become one of the healthiest cities in the world. Under his direction an ample supply of pure water was obtained, while his advocacy secured for the city a model system of sewage and sewage farms. Nearly every hospital in Berlin bears traces of his initiative or other influence, while several of the great museums dedicated to the education of the public were either entirely created or greatly enlarged by him, notably the Ethnological and Pathological museums. But if the Social Democrats were blind to these things and to the enormous advantages resulting from his being in the Reichstag, Berlin has again and again marked its sense of its overwhelming and everlasting obligation to him, as by giving his name to the enormous new hospital now nearing completion.

Professor Virchow was a most valuable legislator. While not an orator, he was an able and effective speaker who never failed to grasp the situation under discussion in all its bearings. On his feet Virchow was exceedingly calm and deliberate, being never carried away by passion, and his spoken sentences, scarcely distinguishable from his written ones, were clear, forcible, logical and convincing. None held the privileges of the representatives of the people so dear as this man of genius. Nothing which came before the Chamber or Reichstag was of too slight importance to merit his interest. He was always listened to with the deepest attention, particularly when he spoke on the "Kulturkampf," a name invented by him which has become part of the language, and now the only term used to describe the contest between religion and the State.

With Bismarck, a man of Virchow's liberal views was naturally at sword's points, and few if any of his opponents worried the great chancellor as much as this indomitable and magnificently courageous scientist. So bitter, indeed, became their differences that Bismarck challenged him to a duel. A combat was, however, prevented by the intercession of friends, but the controversies between the two form some of the most interesting passages in Bismarck's life, and are given very considerable space in the biographies of the chancellor. In 1877 Virchow paid for his radicalism by being deprived of the rectorate of the University of Berlin, in which he was, however, triumphantly reinstated in 1892. Naturally this punishment, for which Bismarck was largely responsible, was as little able to affect Virchow's views and the vigor of his language, as had been his removal from his lectureship at the beginning of his great career.

In person Virchow was of less than the average stature and of very winning and attractive manners. "His expression," said

one of his students recently, "is that of extraordinary courage; his attention once drawn to you, you feel as if he were fixing you in focus on the object glass of his mental microscope." But there was nothing unfriendly in this gaze. Indeed, his manner frequently deserved the adjective charming, particularly at the dinner table and on social occasions, and few great men have been distinguished by like modesty and unselfishness.

His world-wide travels gave him additional breadth of mind, and a recognition of the aspirations and achievements of other nations which was quite free from any narrow bias of nationality. When he went to England in 1898 to lecture before the Royal Society of Medicine, his speech was most generously appreciative of the labors and achievements of English scientific men. Indeed, he may be said to have taught the English to value the forgotten name of Glisson, while in Italy he informed the Italians of their debt of Margagni. For America and American aspirations he always showed great interest, understanding, and appreciation, though he never visited this country.

Prof. Rudolf Virchow died in Berlin Sept. 5, 1902, aged nearly 81 years. One of the greatest medical discoverers of this or any other age, he spent nearly 60 years in adding to the sum of human knowledge. When, on the occasion of his 80th birthday, statesmen and medical men of all the world united to give him an unparalleled ovation, and Professor Virchow made a speech of two hours, tracing the development of pathological science, it was necessary for him to recount to a great extent his own achievements. "The history of Professor Virchow's life and work," declared the London "Times" in this connection, "forms one of the grandest illustrations of the triumph achieved over every obstacle by genius manifested in infinite labor, and guided by absolute love of truth and dauntless courage."

Virchow lived to a ripe age on five hours sleep a night. His luncheon consisted only of beer and two sandwiches. The floor of his workroom was usually littered with skeletons and skulls. As a pathologist he naturally became an ardent collector. In his museum were 20,000 pathological specimens. He had a bacteriological laboratory which was both large and well equipped.

On the occasion of his 80th birthday, which was celebrated enthusiastically throughout the world, Dr. Mommsen said: "You have broken new ground and laid new foundations for medical science. Your name is written boldly upon the tablets of history, and is honored far beyond the borders of the Fatherland." It was on the occasion of this anniversary that Professor Virchow told a delegation of Americans that he would repay their visit when he was 90 years old.

**Virden,** a city in Macoupin Co., Ill., 20 miles S. W. of Springfield; on the Jackson, Louisville, and St. Louis railroads. It is in a coal mining district, and ships large quantities of coal and grain. It has brick and tile works, 2 private banks, and weekly newspapers. Pop. (1890) 1,610; (1900) 2,280.

**Vireonidæ,** in ornithology, greenlets; a family of small fly-catching passerine birds, with 7 genera and 60 species, restricted to the American continent, where they range from Paraguay to Canada. Bill conical, much compressed, decurved at end, and notched, but scarcely toothed; frontal feathers bristly and erect, or bent but slightly forward; nostrils overhung by membrane; 10 primaries; tarsus longer than middle toe and claw; lateral toes generally unequal, outer claw reaching half-way along middle claw.

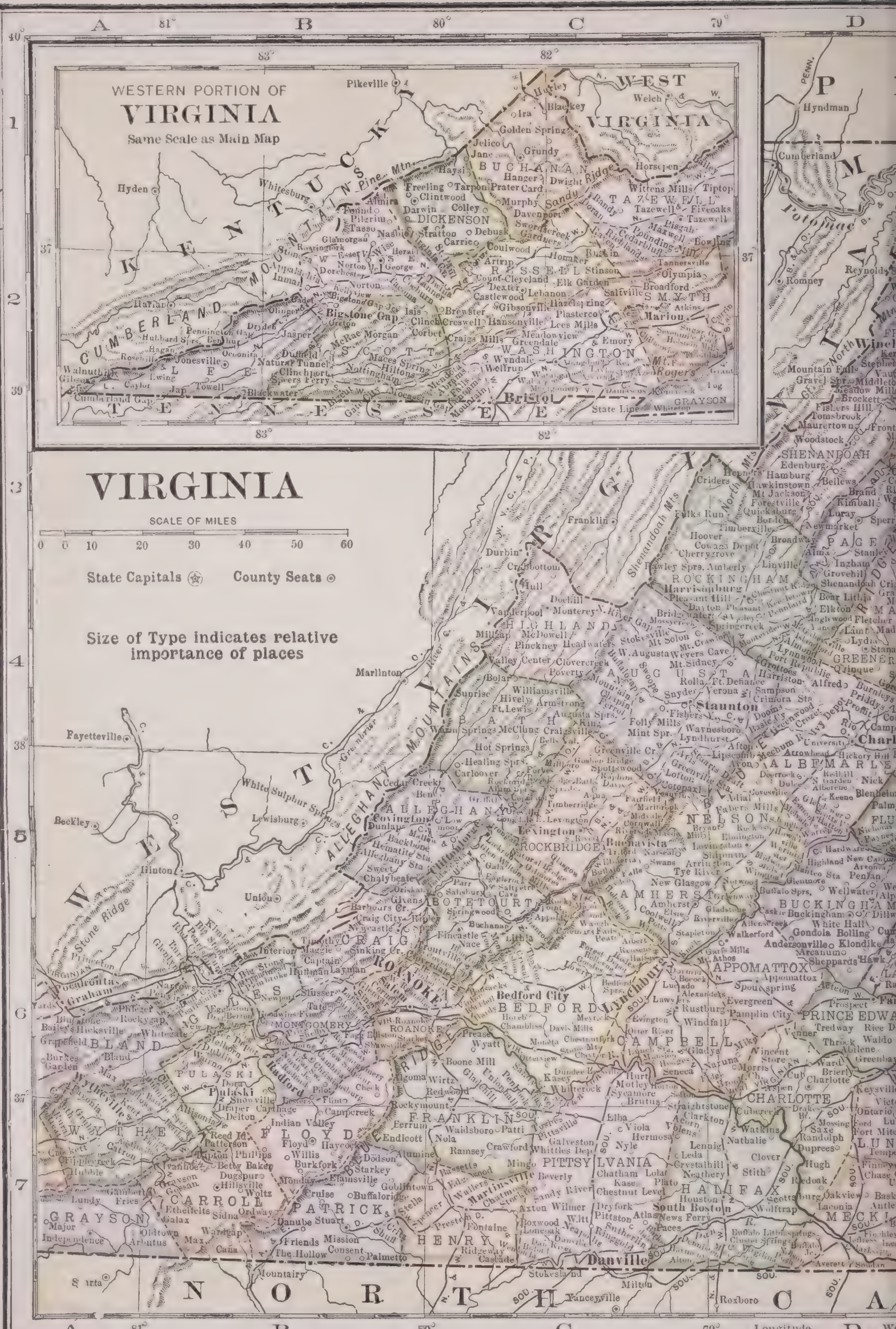
**Virgil.** See VERGIL.

**Virgilia,** in botany, a genus of *Sophoreæ.* Calyx uequally five-toothed; two lower petals combined from the middle to the tip, and curved like a beak; stamens 10, free; legumes leathery, indehiscent. *V. capensis* is a tree 15 or 20 feet high, which grows at the Cape of Good Hope. Its wood is used for yokes, spars, etc., but it is liable to be attacked by worms.

**Virginal,** a stringed instrument played by means of a keyboard, like the modern pianoforte. It was in form like a box, or desk of wood without legs or supports, and was usually placed on a table or stand. The strings were of metal, one for each note, and the sound was made by means of pieces of quill, whalebone, leather, or occasionally elastic metal, attached to slips of wood called "jacks," which were provided with metal springs. The compass was about three octaves. The virginal was a kind of oblong spinnet, and the precursor of the harpsichord, now superseded by the pianoforte. The form *virginals,* a pair of *virginals,* is an old dual (as in *organs, regals,* a pair of *organs*) signifying a graduation or sequence.

**Virginia,** a State in the South Atlantic Division of the North American Union; bounded by Maryland, North Carolina, Tennessee, Kentucky, West Virginia, and the Atlantic Ocean; one of the original 13 States; capital, Richmond; number of counties, 100; area, 40,125 square miles; pop. (1900) 1,854,184; (1910) 2,061,612.

*Topography.*—The surface of the State is diversified, rising in a series of terraces from the coast to the mountains in the N.



VIRGINIA
SCALE OF MILES
0 5 10 20 30 40 50 60
State Capitals
County Seats
Size of Type indicates relative importance of places
WESTERN PORTION OF VIRGINIA
Same Scale as Main Map
A
B
C
D
81°
80°
79°
83°
82°
40°
39°
38°
37°
1
2
3
4
5
6
7
Longitude
KENTUCKY
WEST VIRGINIA
TENNESSEE
NORTH CAROLINA
CUMBERLAND MOUNTAINS
ALLEGHANY MOUNTAINS
BLUE RIDGE
Pine Mtn.
Sandy Ridge
Stone Ridge
Shenandoah Mts
North Mts
Potomac
Greenbrier River
Mt. Rogers
Pikeville
Hyden
Whitesburg
Harlan
Jonesville
Bigstone Gap
Norton
Wise
Clintwood
Grundy
Tazewell
Lebanon
Abingdon
Bristol
Marion
Saltville
Welch
Hyndman
Cumberland
Romney
Woodstock
Edenburg
Mt Jackson
Newmarket
Luray
Harrisonburg
Staunton
Waynesboro
Franklin
Monterey
Marlinton
Fayetteville
Beckley
Hinton
Lewisburg
White Sulphur Springs
Union
Princeton
Pocahontas
Graham
Covington
Clifton Forge
Lexington
Buena Vista
Natural Bridge
Amherst
Lynchburg
Bedford City
Roanoke
Salem
Radford
Pulaski
Wytheville
Hillsville
Floyd
Stuart
Martinsville
Danville
South Boston
Chatham
Appomattox
Buckingham
Charlotte
Rustburg
Mountairy
Yanceyville
Roxboro
Sparta
DICKENSON
BUCHANAN
TAZEWELL
RUSSELL
SMYTH
WASHINGTON
SCOTT
LEE
GRAYSON
SHENANDOAH
ROCKINGHAM
PAGE
HIGHLAND
AUGUSTA
BATH
ALLEGHANY
ROCKBRIDGE
ALBEMARLE
NELSON
AMHERST
BOTETOURT
CRAIG
ROANOKE
MONTGOMERY
GILES
BLAND
PULASKI
WYTHE
CARROLL
FLOYD
FRANKLIN
BEDFORD
CAMPBELL
APPOMATTOX
BUCKINGHAM
CHARLOTTE
PITTSYLVANIA
HALIFAX
HENRY
PATRICK
PRINCE EDWARD
GREENE

78° E 77° F 76° G
40°
39°
38°
37°
Philadelphia
Baltimore
Annapolis
Alexandria
Washington
Dover
Salisbury
Princess Anne
Snow Hill
Leonardtown
Fredericksburg
Manchester
Richmond
Petersburg
Williamsburg
Yorktown
Newport News
Norfolk
Portsmouth
Hampton
Cape Charles
Cape Henry
Virginia Beach
Chesapeake Bay
Delaware Bay
Atlantic Ocean
Potomac River
Rappahannock R.
York R.
James R.
Chesapeake & Delaware Canal
Dismal Swamp
Currituck
Hammond's 8 x 11 Map of Virginia.
Copyright, 1908, by C.S.Hammond & Co., N.Y.
from 78° Greenwich E 77° F 76° G

Virginia

W. Tide-water Virginia is penetrated by the Chesapeake Bay and has a shore line of 1,500 miles. The middle section of the State is an undulating plain with an elevation of from 200 to 500 feet and extends to the foot hills of the Appalachian range. The W. part of the State is mountainous, the Blue Ridge and Piedmont ranges crossing the State in a S. W. direction, and the Alleghenies forming the boundary of West Virginia. The Valley section is a broad belt of rolling country diversified by hills, ridges, and river valleys, lying between the Blue Ridge and Allegheny Mountains. This region contains the valleys of the Shenandoah, Roanoke, James, Kanawha, and Holston rivers. The most important rivers are the Potomac, separating Virginia from Maryland, navigable as far as Alexandria; and the James, with its extensive network of tributries, navigable to Richmond. Both of these rivers empty into Chesapeake Bay.

*Geology and Mineralogy.*—The coast is of Tertiary formation, consisting of sands, clays and marls, while further inland Miocene strata occur and abut against granite, gneiss and other metamorphic rocks. This metamorphic belt contains deposits of gold and iron. Two secondary belts cross the State parallel to the Blue Ridge and contain extensive coal measures. The valley is of Lower Silurian formation. The principal mineral productions in 1900 included coal, 2,393,754 short tons, valued at $2,123,222; coke, 685,156 short tons, valued at $1,464,556; portland cement, 58,479 barrels, valued at $73,099; gypsum, 11,940 short tons, valued at $18,111; mineral waters 1,141,859 gallons, valued at $272,868; gold, 155 fine ounces, valued at $3,200; granite, valued at $211,080; sandstone, $6,000; slate, $190,211; limestone, $403,318; and clay products, $1,093,784.

*Soil and Agriculture.*—The soil in the tide-water region is light and sandy and though nearly worn out by superficial cultivation still yields large crops of vegetables. The soil of the Piedmont, Blue Ridge, and Valley regions are especially fertile, and together with the abundant rainfall, short, mild winters, and long summers, make Virginia a great agricultural State. The production of tobacco amounts to nearly 70,000,000 pounds per year, and the annual peanut crop is valued at $2,500,000. In 1900 the principal farm crops were corn, 28,183,760 bushels, valued at $13,810,042; wheat, 9,421,932 bushels, valued at $6,783,791; oats, 5,167,568 bushels, valued at $1,912,000; rye, 370,125 bushels, valued at $214,672; buckwheat, 58,812 bushels, valued at $32,347; potatoes, 2,223,778 bushels, valued at $1,312,029; and hay, 589,133 tons, valued at $7,835,469.

*Manufactures.*— According to the United States census of 1900, the State had 8,248 manufacturing establishments, employing $103,670,988 capital and 46,900 persons; paying $26,291,792 for wages and $74,851,757 for materials; and having an aggregate output valued at $132,937,910. The principal manufactures, according to the value of output, were flour and grist ($12,687,267); lumber and timber ($12,137,177); chewing and smoking tobacco and snuff ($10,707,766); iron and steel ($88,341,888); railroad cars ($6,277,279); stemmed tobacco ($5,726,859); cigars and cigarettes ($4,843,641); foundry and machine shop products ($4,833,137); and leather ($4,716,920).

*Commerce.*—The imports of merchandise at the ports of Alexandria, Newport News, Petersburg, Norfolk and Portsmouth, and Richmond, during the year 1900, aggregated in value, $4,103,696, and the exports, $44,496,713.

*Banking.*—On Oct. 31, 1901, there were reported 48 National banks in operation, having $5,379,660 in capital; $4,161,515 in outstanding circulation; and $4,152,000 in United States bonds. There were also 111 State banks, with $6,404,550 capital, and $1,822,463 surplus. The exchanges at the United States clearing houses at Norfolk and Richmond, during the year ending Sept. 30, 1901, aggregated $268,448,810, an increase over those of the preceding year of $20,854,087.

*Education.*—At the end of the school year 1899–1900 the children of school age, numbered 626,210, the enrollment in public schools, 358,825; and average daily attendance, 203,136. There were 7,218 public school buildings, public school property valued at $3,336,166; and 8,836 teachers. For higher education there were 77 public high schools, 80 private secondary schools, 3 public and 7 private normal schools, 10 universities and colleges for men and for both sexes, and 12 women's colleges. The principal colleges include the University of Virginia, at Charlottesville; Richmond College, at Richmond; the College of William and Mary, at Williamsburg; Washington and Lee University, at Lexington; the Randolph-Macon Women's College, at Lynchburg; Hollins Institute, at Hollins; and the Norfolk College for Young Women, at Norfolk.

*Churches.*—The strongest denominations in the State are the Regular Baptist, Colored; Methodist Episcopal, South; Regular Baptist, South; African Methodist; Presbyterian, South; Protestant Episcopal; Methodist Episcopal; Disciples of Christ; Roman Catholic; Lutheran, General Synod; Primitive Baptists; Dunkard and Christian. In 1899 there were reported 4,201 Evangelical Sunday-schools, with 48,531 officers and teachers, and 293,336 scholars.

*Postoffices and Periodicals.*— On Jan. 1, 1901, there were 3,575 postoffices of all grades; and 244 periodicals, of which 31

were daily, 2 tri-weekly, 6 semi-weekly, 181 weekly, 2 semi-monthly, 39 monthly, 2 bi-monthly, and 1 quarterly.

*Railroads.*—The total length of railroads within the State, Jan. 1, 1901, was 3,801 miles, of which, 70 miles were constructed during the previous year.

*Finances.*— On March 1, 1901, the State debt was $24,353,327, divided into Riddleberger Bonds, Act of 1882, $6,329,554, and Century Bonds, dated 1891, $18,023,773. The assessed valuation in 1900 was, real estate, $316,563,279; personal property, $107,279,401; total, $423,842,680. The tax rate was $4.00 per $1,000.

*State Government.*—The Governor is elected for a term of four years and receives a salary of $5,000 per annum. Legislative sessions are held biennially in odd years, beginning on the first Wednesday in January, and are limited in length to 90 days each, but may be extended for a period not exceeding 30 days, upon a three-fifths vote of both houses. The Legislature has 40 members in the Senate and 100 in the House, each of whom receives $4.00 per day and mileage. There are 10 Representatives in Congress. The State government in 1902 was Democratic.

*History.*—The first settlement in Virginia was made at Jamestown, by the English in 1607. The London company was reorganized in 1609 and received an extensive territorial grant. After passing through the starving time, and being saved from destruction through the efforts of John Smith the colony became very prosperous. In 1621 a legislature was formed, and in 1676 there occurred Bacon's rebellion brought on by the tyranny of Sir William Berkeley, the royal governor. George Washington first became known during the French and Indian War, in 1754 as an officer in the Virginia militia. This colony under the head of Patrick Henry, was the first to resent British oppression in 1764. During the Revolution several important engagements took place on Virginian soil, most notable being the defeat and surrender of Cornwallis at Yorktown, Oct. 19, 1781. Virginia joined the Confederacy and passed an ordinance of secession on April 17, 1861, and became the scene of some of the most important battles of the Civil War, among them being the two battles of Bull Run, Winchester, Fredericksburg, Chancellorsville, the Peninsular campaign, and the battles of the Wilderness campaign; ending in the final surrender of Gen. Robert E. Lee at Appomattox Court House, April 9, 1865. Virginia was readmitted to the Union Jan. 27, 1870, and in 1881 celebrated the 100th anniversary of the surrender at Yorktown by laying the corner stone of a national monument, Oct. 18, 1881. During the American-Spanish War in 1898, an extensive military camp was established at Camp Alger, near Falls Church, in this State.

**Virginia,** the daughter of Lucius Virginius, whom Appius Claudius, the decemvir, endeavored to carry off from her parents. Her father, finding he could not save her by any other means, slew her in the open forum and raised an insurrection, which overthrew the decemvirate and restored the old magistracy. This happened, it is said, in 449 B. C.

**Virginia, University of,** an educational non-sectarian institution in Charlottesville, Va.; opened in 1825; has productive funds exceeding $1,500,000; grounds and buildings valued at over $2,000,000; volumes in the library, about 70,000; scientific apparatus, etc., $335,000; average number of faculty, 73; average student attendance, 785; ordinary income, about $380,000.

**Virginia City,** a city and county-seat of Storey co., Nev.; on the Virginia and Truckee railroad; 15 miles N. N. E. of Carson City. It is built on the E. slope of Mt. Davidson, at an elevation of 7,825 feet above sea-level. Here are public and private schools, court house, St. Mary's Hospital, a county hospital, banks, and several newspapers. The city owes its growth to the famous Comstock mines, from which have been taken over $400,000,000 in gold bullion. The city has many ore smelting and refining plants built at a cost of from $350,000 to $1,000,000 each. Virginia City was settled in 1859, and was incorporated in 1861. Pop. (1900) 2,695; (1910) 2,244.

**Virginian Creeper,** the *Ampelopsis hederacea,* a climbing plant, native to North America, used as an ornamental covering for walls, etc., and sometimes called American ivy. Its leaves turn a bright red in the autumn.

**Virginian Opossum,** the *Didelphys virginianum,* the common opossum. It is about the size of a domestic cat; head long, large, and pointed, ending in a naked snout. Hair long, soft, and woolly, whitish at the roots and brownish at the tips, giving the animal a dusky appearance.

**Virginian Deer,** the *Cervus virginiacus,* the common deer of North America. It is slightly smaller than the fallow deer; reddish-yellow in summer, light gray in winter; antlers recurvine; tail about a foot and a half long. These deer are timid and wild, and therefore domesticated with difficulty. Their flesh formerly constituted the staple food of the native Indians.

**Virginian Eared Owl,** the *Bubo virginianus,* a large species common over the Northern States of the American Union. Length about two feet; reddish-brown on upper surface, mottled with black, and cov-

ered with regular bands of the same hue, lighter beneath; throat white; beak and claws black.

**Virginian Quail,** the *Ortyx Virgiana*, a species of rasorial birds belonging to the family *Odontophorinæ*, and nearly allied to that of the partridges or *Perdicidæ*. In the genus *Ortyx* the edges of the beak are sinuous or wavy, and the wings have the third to the sixth quills longest. The outer toe is united to the inner at the base. The Virginian quail is also named the Virginian colin. It attains a length of 8 or 10 inches, and is of a reddish-brown hue, mingled with grey and black above, and yellowish white below. The head and breast are reddish brown and the chin pure white. The voice is clear, and the note resembles the words "bob-white"—a name often familiarly given to the bird. The Virginian quail feeds mostly on grains and inhabits open grounds, but in winter it approaches the habitations of man. The eggs may number as many as 24. The birds is trapped in great numbers in winter. Its flesh is highly esteemed.

**Virginia Military Institute,** an educational non-sectarian institution in Lexington, Va.; established by the State in 1839; has buildings and grounds valued at over $600,000; productive funds, $20,000; scientific apparatus, etc., $15,000; volumes in library, about 16,000; average faculty, 20; average students, 355; graduates, over 2,200.

**Virginia Polytechnic Institute,** an educational non-sectarian institution in Blacksburg, Va.; opened in 1872; has productive funds exceeding $270,000; grounds and buildings valued at over $500,000; scientific apparatus, etc., $120,000; volumes in the library, about 11,000; average faculty, 64; average students, 560; graduates, over 800.

**Virginia Resolutions,** resolutions drawn up by James Madison in 1798, similar in import to the Kentucky Resolutions of that year.

**Virginic Acid,** a reddish yellow oil obtained by heating the fat oil of the Virginian senega root to 200°. It has a strong odor, and a sharp taste, is insoluble in water, but soluble in alcohol and ether.

**Virgin Islands,** a group of the Leeward Islands in the West Indies; area 58 square miles; pop. 4,639. They consist of all the group not occupied by Denmark except Carab Island, which is Spanish. The inhabitants are mostly peasant proprietors; and cotton and sugar are cultivated. The chief town is Roadtown. The islands were named by Columbus in honor of the 11,000 virgins who were supposed to have been massacred with ST. URSULA (*q. v.*).

**Virginius Affair, The.** In the year 1873 the civilized world in general, and the United States especially, was greatly shocked and stirred up by the capture of the "Virginius," and the murder of a portion of her crew. The "Virginius" was said to be an English-built, side-wheel steamer originally called the "Virgin," and was distinguished as a daring blockade runner during the war between the States. In 1870, it is said, she was sold in Washington to an agent of the Cuban junta, and her name was changed to the "Virginius." For three years thereafter she made a number of successful and daring expeditions to the Cuban coast, carrying clothing, food, ammunition, and arms to the insurgents. On Oct. 23, 1873, the "Virginius" cleared from the United States consulate in Kingston, Jamaica, as a United States vessel bound for Port Limon, Costa Rica. On board were a number of Cuban insurgents, and the crew was composed of Americans, Cubans, and some others. On board, too, were a number of enlisted men to join the insurgent army. The commander of the "Virginius" was named Capt. Joseph Fry, a citizen of the United States. A Spanish gunboat, "Tornado"—constructed, it is said, by the same English firm that built the "Virginius"—discovered the latter on the 31st day of October, as she was approaching the Cuban coast, and chased her for eight hours, capturing her about 10 o'clock that night, and taking her to Santiago de Cuba; Captain Fry claiming that his boat flew American colors, had an American crew, and was an American ship. The 155 men captured were taken ashore, placed in close confinement, and court-martialed, and the most of them sentenced to be shot.

The whole proceedings were very summary and rapid. Four days thereafter the first four were shot, Brigadier-General Ryan being one, though he claimed to be a Canadian, and therefore a British citizen. These men, according to the usual Spanish style, were shot in the back, and afterward their heads were cut off and displayed on spikes, while their bodies were trampled by horses. After an interval of 12 days, 12 more of them were shot, and 5 days later 37 were executed, these last being the officers and crew of the "Virginius" and some of them American citizens. It is said that the American flag was not flying from its staff and that the American consul was directed to keep in his office. Captain Fry was among the first 10 who were shot; and some of the men, it is reported, were not killed by the firing, but were shot afterward through their mouths by the Spanish soldiers. Burriel, the Spanish general, seemed to have been a regular butcher. He promptly refused all protests of the American and British vice-consuls, and would not allow them to use the telegraph to communicate with their governments. It is said the American vice-consul, Schmidt, wrote re-

peated communications to General Burriel, but failed to get replies, except in one instance when that blood-thirsty Spaniard told him that he should have known that the day previous was religious festival, during which he and all of his officers were engaged in meditation on the divine mysteries and could not consider temporal affairs. Fortunately news of what was going on reached Jamaica, and the British gunboat "Niobe," Capt. Sir Lambton Lorraine, left for the scene of massacre. The captain was on shore at Santiago almost before his ship had dropped anchor, and declared that he would bombard the city if there was another man executed. Ninety-three men were still alive, and their execution he demanded should be suspended.

These acts at Santiago were in keeping with much else which had been done of similar nature, but perhaps on not so large a scale, and aroused the public indignation of the United States, and mass meetings were held demanding vengeance on Spain. Admiral Polo de Bernabe, the father of the last Spanish minister who succeeded De Lome, wanted to submit the matter to arbitration, but Hamilton Fish, then Secretary of State, very properly replied to him that the capture on the high seas in a time of peace of a vessel bearing the register and papers of an American ship was not deemed referable to other powers to determine. The nation must be the judge and custodian of its own honor. And on Nov. 4 Secretary Fish cabled to General Sickles, then American minister to Madrid, that, "In case of refusal of satisfactory reparation within 12 days from this date, close your legation and leave Madrid. If Spain cannot redress these outrages the United States will." The matter was finally settled by Spain agreeing to surrender to an American ship the "Virginius" and the survivors of those who had been captured with her, and that on Sept. 25 the United States flag should be saluted by the "Tornado." Of course these terms contemplated that the "Virginius" should be surrendered in Santiago, or taken to Havana for that purpose, but the Spanish took the vessel to an obscure harbor, Bahia Honda, and there delivered her to Capt. W. D. Whiting, chief of staff of the North Atlantic Squadron. Lieutenant Marix was his flag lieutenant, the same officer who was recently judge advocate on the court of inquiry on the "Maine" disaster. The salute to the flag never took place and no indemnity was ever paid for the lives of the American citizens who had been executed. Right then and there the United States should have declared war on Spain; but, in lieu thereof, she allowed the incident to be closed and the vessel to be surrendered in a little obscure place in order to avoid the publicity of the "Virginius" being returned; and this publicity was one

Virginius Affair

of the principal subjects the United States was supposed to have in mind when she arranged the terms. Spain came out of the affair with flying colors. The "Virginius" was of no use to her, or, indeed, to anybody else, because she was not seaworthy, and a little later sank on her way to New York. The United States went through the form of exacting certain conditions in order to appease some of her people, but at the same time was very careful not to insist on conditions which Spain might refuse, and thus leave her the alternative of declaring war. An eyewitness of this transfer of the "Virginius" writes:

"While the Spanish officer was courtesy itself, we were all impressed with the fact that the ceremony was lacking in dignity and that the Spaniards had purposely made that lack as conspicuous as they dared. It appeared that the 'Virginius' was towed from Havana by the first-class man-of-war 'Isabella la Catolica,' the commander of which retired immediately and left the surrender to be made by the commander of the 'Favorita,' which had been in the vicinity of Bahia Honda for several months engaged in surveying duty. The surrender should have taken place either at Santiago de Cuba or at Havana, and a Spanish officer of like rank with Captain Whiting should have discharged the duty. A quick survey by our officers showed the 'Virginius' to be in a most filthy condition. She was stripped of almost everything movable save a few vermin which haunted the mattresses and cushions in cabin and staterooms, and half a dozen casks of water. The decks were caked with dirt, and nuisances recently committed, combined with mold and decomposition, caused a foul stench in the forecastle and below the hatches. In the cabin, however, the odor of carbolic acid gave evidence that an attempt had been made to make that part of the vessel habitable for the temporary custodians of the ship. Our officers were reluctant to put the men into the dirty forecastle and stowed them away into hardly more agreeable quarters afforded by the staterooms of Ryan and his butchered companions. Some attempt seemed to have been made, as shown by the engineering survey, to repair the machinery, but a few hours' work put the engines in working order. The ship was leaking considerably and the pumps had to be kept going constantly to keep the water down. After a few hours of hard work we got under way, but had only gone 200 yards when the engine suddenly refused to do duty, and it became necessary for the 'Dispatch' to take us in tow. As we passed the fort at the entrance to the harbor the Spanish flag was rather defiantly displayed by that antiquated apology for a fortification, and there was no salute for the American flag, either from the fort or the surrendering sloop of war.

"We had a hard time that night, those of us who were aboard the 'Virginius.' It seemed hardly possible that we could keep afloat till morning. During the night the navy tug 'Fortune' from Key West met us and remained with the convoy. At noon the next day, when we were about 30 miles S. S. E. of Dry Tortugas, the vessels separated, the 'Virginius' and 'Dispatch' going to Tortugas and the 'Fortune' returning, with me as a solitary passenger, to Key West, whence I had the honor of reporting the news to the admiral and of sending an exclusive report of the surrender.

"It was the general opinion among the naval officers that Spain had endeavored to belittle the whole proceeding by ordering the smuggling of the 'Virginius' out of Havana, by selecting an obscure harbor not a port of entry as the place of surrender, and by turning the duty of surrender over to a surveying sloop, while the 'Tornado,' which made the capture, lay in the harbor of Havana and the 'Isabella la Catolica,' which had been selected as convoy, steamed back to Havana under cover of the night. The American officers and American residents in Cuba and Key West agreed that our government ought to have required that the 'Virginius' should be surrendered with all the released prisoners on board either at Santiago de Cuba, where the 'Tornado' brought her ill-gotten prey and where the inhuman butcheries were committed, or in Havana, where she was afterward taken in triumph and greeted with the cheers of the excited Spaniards over the humiliation of the Americans.

"An attempt was made to take the 'Virginius' to some Northern port, but the old hulk was not equal to the journey. On the way no pumping or calking could stop her leaks, and she foundered in mid ocean. The government had been puzzled to know what disposition to make of her, and there was great relief in official circles to know that she was out of the way.

"The surrender of the surviving prisoners of the massacre took place in course of time at Santiago, owing more to British insistence than to our feeble representations. As to the 53 who were killed, the Madrid government unblushingly denied that there had been any killing, and when forced to acknowledge the fact they put us off with preposterous excuses. 'Butcher Burriel,' by whose orders the outrage was perpetrated, was considered at Madrid to have been justified by circumstances. It was pretended that orders to suspend the execution of Ryan and his associates were 'unfortunately' received too late, owing to interruption of telegraph lines by the insurgents, to whose broad and bleeding shoulders an attempt was thus made to shift the responsibility. There was a nominal repudiation of Burriel's act, and a promise was made to inflict punishment on those who had offended, but no punishment was inflicted on anybody. The Spanish government, with characteristic double-dealing, resorted to procrastination, prevarication and trickery, and thus gained time till new issues effaced in the American mind the memory of old wrongs unavenged. Instead of being degraded, Burriel was promoted. Never to this day has there been any adequate atonement by Spain."

FITZHUGH LEE.

**Virtual Image,** in optics, an appearance thus explained:

"There are two cases relative to the direction of rays reflected by mirrors according as the rays after reflection are convergent or divergent. In the first case the reflected rays do not meet, but if they are supposed to be produced on the other side of the mirror, their prolongations coincide in the same point. The eye is then affected, just as if the rays proceeded from this point, and it sees an image. But the image has no real existence, the luminous rays do not come from the other side of the mirror; this appearance is called the virtual image. The images of real objects produced by plane mirrors are of this kind."—Ganot, "Physics."

**Virtual Velocity,** the velocity which a body in equilibrium would actually acquire during the first instant of its motion in case of the equilibrium being disturbed. The proposition known as the principle of virtual velocities is thus stated:

"Suppose a system of forces in equilibrium, and imagine the points of application of the forces to undergo very slight displacements, then the algebraical sum of the products of such force into its virtual velocity vanishes; and, conversely, if this sum vanishes for all possible displacements, the system of forces is in equilibrium."

**Virtuso,** a man skilled in the fine arts, as painting, music, or sculpture; a skilled performer on some musical intrument; a connoisseur of antiquities, curiosities, and the like.

**Virus** (Latin, "a poisonous fluid"), a term used in medicine to designate the *materies morbi* of zymotic diseases. It more specially designates those peculiar poisonous matters which can reproduce themselves under favoring conditions to an endless degree. The poison of the cobra is a specific virus which, when introduced into the human system, acts as a most virulent poison; but the poison is not multiplied within the human subject, and one person affected by the poison cannot communicate the disease to another. In like manner, morbid products from decaying vegetables under certain conditions of heat and moisture may possibly originate the virus of malarial fever; but the virus is not propagated within the human organism, or, at all events, never in such a form as to render it capable of producing the same disease in others. By some the virus of the contagious or infectious diseases is supposed to be a *contagium vivum seu animatum*, the theory being that the virus consists of living beings or low organisms. Such views have been advocated

by Kircher, Lancisi, Vallisneri, Reaumur, Linné, Henle, Roberts, and others; and although the theory of a *contagium vivum* is not as yet complete, the discussion of it is the most important which has ever engaged the attention of medical men. The most prominent characteristic of each specific virus is that it can reproduce itself within the human organism, and to an unlimited extent, each virus preserving its own specificness. Experience and observation tend to confirm the hypothesis that each specific disease breeds true, though, in the course of 1,000 years, it is possible that changes within certain limits may take place, as in the case in animals and plants. The natural conclusion follows that diseases of this class do not originate spontaneously, but are propagated each from its own kind, though some contend that they do not originate, even in our own day, spontaneously or autochthonously. Another remarkable peculiarity belonging to many, but not to all, diseases propagated by a specific virus, is that a single attack of the disease successfully surmounted produces absolute or relative immunity for a certain length of time, or even for the remainder of life. See BACTERIA.

**Visayas, The,** a group of islands which occupy the central part of the Philippine Archipelago, between Luzon on the N., Mindanao on the S., the Pacific Ocean on the E., and Paragua on the W. They lie between lat. 9° 2′ and 12° 39′ N., and between lon. 121° 48′ and 125° 50′ W.; area, 57,714 square kilometers; pop. (1903) 2,629,495. The group may be divided into three parts, each including several adjacent islands. The principal islands of the first group are Romblon and Panay, of the second, Negros, Cebu, and Bohol, and of the third, Samar and Leyte. Many of the islands are mountainous, but there are valleys and plains which are usually very fertile. Agriculture is quite extensively carried on. There are large crops of rice, sugar cane, subacao, coffee, chocolate, wheat, corn, tobacco, hemp, etc. The forests of the islands are generally rich in excellent building and cabinet woods, such as molave, ipil, banaba, durigon, alintatao, narra, etc. There is also found in the forests an abundance of pitch, resin, gum, mastic wax, and honey. Gold, silver, lead, coal, marble, etc., are mined to a greater or less extent in some of the islands. Manufacturing is carried on to a considerable extent. In the province of Antique, on the island of Panay, the manufacture of fabrics from pineapple fiber, jusi, and sinamay, gives employment to about 12,000 women in some 7,000 shops. Hunting and fishing are also important industries.

**Viscaceæ,** in botany, an order of epigynous exogens, alliance Asarales, proposed by Miers for the reception of Viscum and its immediate allies, which he considered more akin to *Santalaceæ* than to *Loranthaceæ*. Lindley leaves the genera in *Loranthaceæ*.

**Viscacha,** in zoölogy, the *Lagostomus trichodatylus*, a stout-built rodent, resembling a marmot, from 18 inches to two feet long, exclusive of the tail, which is from six to eight inches. Four digits on the fore and three on the hind limbs, the latter furnished with long, compressed, and pointed nails; muffle broad, and covered with a velvet-like coat of brown hair; fur mottled gray above, yellowish-white beneath; dark band on each cheek, a white band on muzzle, running back on each side almost as far as the eye. They are nocturnal, and resemble rabbits in their

VISCACHA.

movements, but are less active. They are found on the pampas, from Buenos Ayres to Patagonia. These animals have the strange habit of dragging all sorts of hard and apparently useless objects to the mouth of their burrow, where bones, stones, thistle stalks, and lumps of earth may be found collected into a large heap, sufficient, according to Darwin, to fill a wheelbarrow.

**Viscautschin,** the portion of crude viscin which is insoluble in alcohol and ether; sp. gr. 0.978. It is the substance to which bird-lime owes its adhesive properties, and is insoluble in alcohol and ether. Heated to 120°, it has the consistency of olive oil.

**Viscaya.** See BISCAY.

**Viscene,** a mobile, yellowish oil, obtained by the dry distillation of viscin. It has a sp. gr. of 0.85, and distills almost completely at 226°.

**Viscera,** in anatomy, the contents of the great cavities of the body, as of the skull, chest, and abdomen, but in popular language restricted to the organs of the thorax and abdomen; the bowels; the entrails.

**Viscaya,** a Spanish armored cruiser; displacement, 7,000 tons; length, 340 feet; breadth, 65 feet; maximum draft, 21 feet 6 inches; horse power, 13,000; armor, belt 12 inch, gun positions 10½ inch; deck plat-

ing 3 inch; batteries, two 11-inch, ten 5.5 inch rapid-fire, two 2.7 inch, eight 2.2 inch, four 1.4 inch, and two muzzle loading rifled guns; six torpedo tubes; speed, 20 knots; officers and crew, 500; cost, $600,000. She was destroyed by the American fleet in the battle off Santiago, July 3, 1898. See SANTIAGO, NAVAL BATTLE OF.

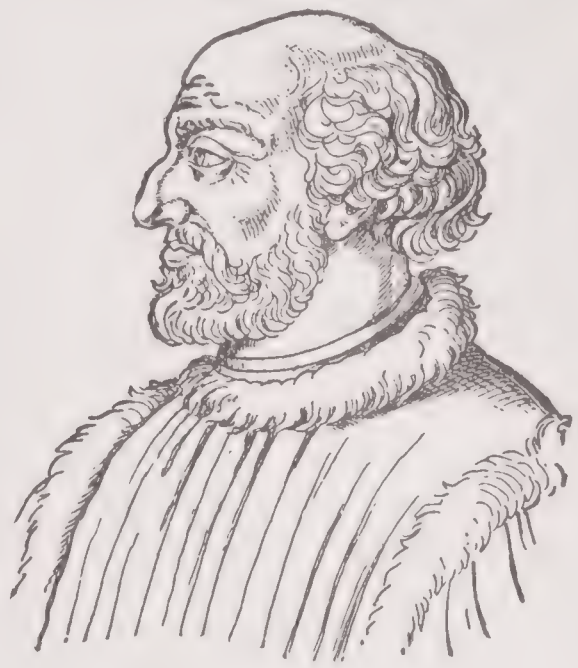
**Vischer, Peter,** a German sculptor; born in Nuremberg, Bavaria, in 1455, son of a worker in bronze. He attained great fame as an artist, and received orders both from German and foreign princes. His most celebrated work is the tomb of St. Sebaldas in Nuremberg, which contains 72 figures, besides those of the apostles and prophets. He died in Nuremberg Jan. 7, 1529.

BAS-RELIEF AT REGENSBURG BY VISCHER.

**Viscin,** a waxy substance, the principal constituent of bird-lime, extracted from the stalks, leaves, and berries of the mistletoe. It is clear, colorless, inodorous, and tasteless, insoluble in water, but slightly soluble in alcohol, has the consistency of honey at ordinary temperatures, but becomes more fluid at 30°. Heated to 100°, it is as fluid as almond oil.

**Viscinol,** a fragrant oil prepared by mixing viscine with soda-lye, and distilling the resulting crystalline mass with water.

**Visconti,** the name of one of the most illustrious families of Lombardy, which rose to sovereign rank in Northern Italy in the 13th century, and was equally distinguished by the share it took in the political contests of the Middle Ages, and by the services which it rendered to literature and science. The name Visconti is derived from the Latin *vice-comites,* and at first was merely the title of an office, but it gradually became a family surname, though when it came to be applied to this family authentic history fails to explain. The power of Visconti began in 1277, when Ottone Visconti, archbishop of Milan, vanquished his popular opponents headed by Martino della Torre, and became perpetual Lord of Milan. Two of the most important members of the family were, Matteo, who was compelled to resign by Pope John XXII.; and Giovanni Galeazzo, who brought the power and grandeur of Visconti to its highest point. He founded the library at Paris; the Cathedral of Milan, etc.; and conquered Padua Verona, Vicenza, etc. In 1441, Filippo-Maria Visconti engaged the services of Francesco



MATTEO VISCONTI.

Sforza, to whom he gave his natural daughter Bianca in marriage; and on his death in 1447, the Visconti family was succeeded by that of Sforza in the lordship of the Milanese.

**Visconti, Ennio Quirino,** an Italian archæologist; born in Rome, Italy, Nov. 1, 1751. In his 14th year he translated into Italian verse the "Hecuba" of Euripides.

GIOVANNI VISCONTI.

His greatest work is "Grecian Iconography" (3 vols. 1808). He visited London at the invitation of Lord Elgin to inspect the Elgin Marbles, 1817, and wrote "Memoirs on the Works of Sculpture from the Parthenon" (1818). He died Feb. 7, 1818.

**Viscosimeter,** a name given by Dollfus to an apparatus for measuring the viscosity of coloring liquids thickened with gum, by

comparing the time required by a given quantity of the liquid to pass through a certain aperture, with that required by an equal quantity of water.

**Viscosity,** the property of matter which is in evidence when the relative motion of parts of any body or substance decays on its being left to itself. The gradual cessation of waves on the sea or of wind in the air, the dying away of sound, the frittering away of the energy of a tuning fork are illustrations of the effect of viscosity. The property is possessed by all substances, gaseous, liquid, and solid. The kinetic theory of gases gives a very simple explanation of viscosity in fluids, or fluid friction as it is also called. Suppose, for example, that there are two contiguous layers of gas flowing with different speeds. This fact will not prevent the individual molecules diffusing across the interface that separates the two regions. Thus the one layer will on the whole gain momentum, and the other lose it, in the direction of motion of the latter. The tendency will be to an equalization of momentum of the two regions, and the rate at which this takes place across unit area is the measure of the viscosity. Though the molecules of a liquid have not so great freedom of individual motion as have those of a gas, still it is easy to see that a similar interaction will take place between contiguous finite portions moving relatively to one another. The action will no doubt involve dissociation or the breaking up of groups of molecules which assume other and for the moment more stable configurations. According to Maxwell's theory of the constitution of bodies, the difference between a liquid and a solid is that in the former all the groups of molecules readily break up, while in the latter only a small number do so. But it is evident that, if only one of a vast number of molecular groups so yields to the stresses acting on it, the perfect elasticity of the substance will be destroyed. The substance on recovering will not be able to give back the energy spent in deforming it. Any vibrating solid, such as a tuning fork or wire undergoing torsional oscillations, loses more or less rapidly its energy of motion. In ordinary circumstances this loss is largely due to the resistance of the air, which is ultimately determined by its viscosity. But even if the vibrations were executed in a perfect vacuum there would still be decay of motion in virtue of the viscosity of the solid material itself. The amount of viscosity will depend upon the number of molecular groupings, which break up under influence of the imposed stresses and assume new configurations of stability.

**Viscous Fermentation,** a change brought about in saccharine solutions by the aid of a particular ferment, consisting of an aggregation of single cells, each containing a single bright nucleus. The product of fermentation is a gum-like ropy substance, the presence of which in a solution has the power of arresting ordinary or vinous fermentation.

**Viscount,** a degree or title of nobility ranking next below an earl, and above a baron. It is the most recently established English title of nobility, having been first conferred by letters patent from Henry VI. on John Lord Beaumont, in A. D. 1440. The title of viscount is frequently held in England as the second title of an earl, and is borne by the eldest son as a courtesy title during the life of his father. The coronet of a viscount of England is composed of a circle of gold, chased, having on the edge 12, 14, or 16 pearls; the cap of crimson velvet, turned up with ermine, and closed at the top with a rich tassel of gold.

**Viscum,** the mistletoe; a genus of *Loranthaceæ.* Leaves opposite, whorled, or wanting; flowers unisexual; males with the calyx obsolete; four petals, ovate, fleshy, united at the base, and bearing each a single anther, adnate with its upper surface. Fertile flowers, with a superior calyx having an obscure margin; four erect, ovate, very minute petals, and a sessile stigma. Known species believed to be about 100; from hot and temperate climates.

**Vise,** a staircase winding round a perpendicular pillar called a newel. The steps are each formed of a single stone, and one end forms part of and is supported by the newel, while the other end is inserted into the wall.

**Vishni-Volotchok,** a town of Russia, province of Tver; on the Zna and the canal joining that river to the Tverza; 218 miles S. E. of St. Petersburg. It is the central point of an important system of canals, which includes 76 lakes and 106 larger and smaller rivers; and through the Tverza, an affluent of the Volga on the one hand, and the Mista, the Volchov and Lake Ladoga on the other, it connects the Caspian and the Baltic. The chief industry of Vishni-Volotchok is cotton spinning.

**Vishnu,** in Brahmanism, the second person of the modern Hindu Trimurti. When he first appears in Vedic times, he is simply the God of the Shining Firmament, the younger brother of Indra, and inferior to him in dignity. By the time that the epic poems, the Ramayana and the Mahabharat, were composed, Vishnu had made a considerable advance to his present position, the full attainment of which, however, was reserved for the period of the Puranas. One of these books is called the Vishnu Purana. He is regarded as the member of the triad whose special function is to preserve. To

do this he nine times successively became incarnate, and will do so once more. The first time he appeared, it was as a fish to warn a righteous king, Manu, of an approaching deluge, and save the sacred Vedas from being lost. His second appearance was as a tortoise to support the world, while the gods and goddesses churned the sea; the third, as a boar, to lift up the submerged world on his tusks; the fourth, as a man-lion, to tear to pieces an impious king; the fifth, as a dwarf, to recover for the gods their supremacy lost by their neglect; the sixth, as Parasurama, to wash away the sins of the earth by the destruction of the Kshatriya race — probably an allusion to the historic fact that when the Aryan Brahman and Kshatriya warriors had well established themselves in India, jealousies arose between them, and the Kshatriyas were vanquished, and in large measure destroyed, by the Brahmans; the seventh, was as Rama, the hero of the Ramayana; the eighth, as Krisha; the ninth, as Buddha; and the tenth, as Kalki, or the White Horse, is still to come. When it arrives, Vishnu shall appear on a white horse, with a drawn sword, wherewith he shall destroy the wicked, and thus prepare the way for a renovated world. Vishnu himself is generally represented as a dark-blue man, with four arms, the first holding a war club, the second a conch shell, the third a quoit-like weapon called Chakra, and the fourth a water lily. His two most popular incarnations are as Rama and Krishna. His most enthusiastic followers are generally drawn from the middle classes of Hindu society. His mark on their foreheads is a trident, with a yellow fork in the center, and a white one on each side. Many monastic sects worship him almost exclusively.

**Visible Church,** in theology, the Church, as seen by man, not as it appears to God. It includes the whole body of professing Christians, some of them regenerate, others unregenerate; the two classes commingled, as were the wheat and tares mentioned in the parable (Matt. xiii: 24–30). It is distinguished from the Invisible Church, consisting only of the regenerate; but who are worthy of this designation is known only to God. (I Kings xix: 10, 14, 18.)

**Visible Speech,** the system of expressing speech sounds by written symbols, invented by Prof. Alexander Melville Bell during the years 1849–1864. Its fundamental principle is, says its author, "that all relations of sound are symbolized by relations of form, each organ and each mode of organic action having its appropriate symbol, and all sounds of the same nature produced at different parts of the mouth (such as *t* and *d*, *b* and *p*) being represented by a single symbol turned in a direction corresponding to the organic position." The shapes of these symbols not being founded on any existing alphabet, the system here can only be illustrated, in the absence of the peculiar fount, by two that bear an accidental likeness to our current letters — O, symbolizing that the throat is open, and C, that part of the mouth is contracted. Among the advantages claimed for visible speech by Professor Bell are its power of representing the exact sounds of foreign languages (even Zulu clicks), and the facilities offered by it toward teaching the illiterate and blind to read, and the deaf and dumb to speak. But though the first at least of these claims has been established by rigid tests, and is admitted by A. J. Ellis and other eminent phonologists, the system has not, as its inventor hoped, been taken up by the government. See Bell's "Visible Speech," "The Science of Universal Alphabetics" (London, 1867).

**Visigoths,** the Western Goths, who came from Scandinavia, and settled in Mœsia, A. D. 376. They established themselves in Gaul A. D. 412, and, passing into Spain, founded a kingdom there in 414, which was overthrown by the Moors in 712. The names of the kings were:

| | | | |
|---|---|---|---|
| Ataulfus ..... | to 414 | Vitteric ..... | 603-610 |
| Wallia ..... | 415-418 | Gundemar .... | 610-612 |
| Theodorês .... | 418- ? | Sisebut ..... | 612-620 |
| Theudis ..... | 541-548 | Recarêd II. ... | 620-621 |
| Theudisele .... | 548-550 | Suintella ..... | 621-631 |
| Agila (at Merida) ..... | 550-556 | Sisenand ..... | 631-636 |
| Atharagild .... | 556-567 | Tulca ..... | 636-642 |
| (Toledo his capital) | | Chindasvindê . | 642-649 |
| Liuva (at Narbonne) ..... | 567-568 | Recesvindê ... | 649-672 |
| Leovigild .... | 568-572 | Wamba ..... | 672-680 |
| Recarêd ..... | 572-586 | Ervigê ..... | 680-687 |
| Liuva II. ..... | 586-603 | Egiza ..... | 687-701 |
| | | Witiza ..... | 701-710 |
| | | Roderic ..... | 710-711 |

**Vision,** the act of seeing, that faculty of the mind by means of which, through its appropriate material organ, the eye, we perceive the visible appearances of the external world. Vision is mainly concerned with the color, form, distance, and tridimensional extension of objects. It is caused by impact of ether waves on the retina of the eye, but if these waves be longer or shorter than a certain limit, there is no visual impression produced by them. The apparent color of an object depends partly on the wave length or wave lengths of the incident light waves, single or mixed, and partly on the state of the eye itself, as in color blindness, or after taking santonine, which makes external objects look yellow, or in jaundice. The apparent brightness of an object depends on the amplitude of the light waves which pass from it to the eye; and the smallest perceptible difference of brightness always bears a nearly constant ratio to the full intensity of the bright objects (Fechner's psychophysical law). As between different colors the eye perceives them with

different intensities, even when the physical intensity is the same; thus yellow appears brighter in a bright light than an equally intense red; and as light fades away the different colors fade away unequally, so that the ratio in Fechner's law is different for each color; red and yellow disappear first, blue last; and thus in a dim light the blue is the brightest.

The leading problems in the theory of vision are, however, those which deal with the nature of our perception of distance and of three-dimensional extension. According to Bishop Berkeley, whose views ("On the Theory of Vision") have met with the widest acceptance, we do not by means of sight perceive either that external objects are outside ourselves or their distance from us; but this knowledge is derived from touch and from our experience of motion from place to place; and as our experience is in general uniform, we come to associate the visible with the tangible so readily that we fancy we directly see visible objects. As regards the distance of any given point, Berkeley maintains that this cannot be seen, "for distance being a line directed endwise to the eye, it projects only one point in the fund of the eye; which point remains invariably the same, whether the distance be longer or shorter." This may be true, and yet the eye may be obliged to put forth perceptibly different efforts in order to discriminate points situated at different distances. Rays proceeding from the distant point form a cone, whose base is the pupil of the eye; and in order to make this divergent cone converge on a point in the retina a distinct effort of focussing or accommodation is necessary for each distance. That the distance may be judged by means of the necessary effort of accommodation may be seen by taking a small thin-edged lens, holding it at arm's length, and viewing distant objects through it. A small inverted image of the distant objects is seen; but on trying to ascertain at what distance this image is situated, the necessary accommodation teaches us that it is situated between the eye and the lens. The effort of accommodation appropriate to each distance is the same whether the rays have actually come from the apparent distant point or not, so long as they approach at a certain angle of divergence; hence rays from clouds reflected in still, turbid water, and continuing their divergence after reflection, approach the eye, and are dealt with by it, as if they had proceeded from a great depth below the surface of the water. Similarly the apparent depth of objects under water is diminished because the amount of divergence of the rays is altered by refraction; and the apparent distance of an object is increased by repeated reflection because after such repeated reflection the rays originally diverging from the object reach the eye diverging as if they had come from a more distant point, the virtual apex of the incomplete cone of ultimately reflected rays.

The axis of the double cone of rays, first divergent as it approaches the eye, and then convergent upon the retina within the eye, fixes the direction of the apparent position of the point (which may or may not be the real position, according to circumstances), and the strain to which the eye is subjected in accommodation measures the apparent distance in that direction.

Further, we have not only to do with the effort of accommodation, but also with the varying amount of convergence of the two eyes, or of their "optic axes," required in order to fasten the gaze upon a more or less distant point; and this will be found to keep pace with the amount of accommodation required by each eye in order to ensure accurate focussing on the retina.

According to the Berkeleian view, however, these considerations involve geometrical questions the nature of which is known to few and is not consciously realized. But, on the contrary, it may be said that these operations of the eye being different for each distance of the object, and being felt to be so — as, for instance, where we look out through a window and feel that the sensation of looking out through the window is different from that of concentrating the gaze on the window bars — there is no need for the geometrical discussion of the problem; the facts of sensation are sufficient. Berkeley said that this difference of sensation does not come into play till the increased divergency becomes so great as to be associated with confused vision; and he maintained that this association was merely accidental, as was, in his view, shown by certain experiments with lenses, in which the withdrawal of the eye from a convex lens produced an apparent approach of the object looked at. This experiment was, however, shown by Wheatstone to be entirely explicable on the basis of an enlarged retinal image. Still the illusions produced by virtual images of objects, the rays reaching the eye as if they had come from points to which no physical reality corresponds, show that we rely in general on the evidence of the sensations of adjustment which accompany vision for the materials as to our judgment of direction, of distance, and of externality; but we interpret these through our tactile experience. In the case of smoke and vapor, which are not tangible, we have a certain amount of experience as to the space and position occupied by them; and in the case of such an object as perfectly polished glass, which is invisible or practically so, we are left to the sense fallacy that where the sight affords us no infor-

mation, owing to the absence of any light rays entering the eye from the object, the inference is drawn, as the basis of previous experience, that there is no tangible object to be taken into consideration. Similarly, with objects too minute for touch, we interpret the indications of sight — *e. g.*, those arrived at with the aid of a microscope — as showing, by analogy, that if we could apply a sufficiently refined sense of touch we would feel the object to give rise to the sensations corresponding to its external aspect. The two sets of sensations, visual and tactile, are essentially independent of one another; but the distance of an object and its external form in three dimensions are learned by comparing the sensations of touch, in the widest sense, with the sensations accompanying vision while the object is still beyond reach; and the experience acquired in infancy becomes a possession of the adult philosopher who has forgotten the mental processes by which he attained it. A mountain in a clear atmosphere, say in Colorado, may appear to the eye to be small and near, when in reality it is high and far; but it does not take long to "educate the eye"—that is, to furnish the mind with a store of experience sufficient as a basis for more accurate inferences.

On ordinary optical principles a point above the direct line of vision comes to a focus at a point of the retina below its center, and vice versa. If the retina could be looked at by another person it would be found that an image of the object is formed on the retina, and that this image is inverted. It has been much questioned how this inverted image can produce the sensation of direct vision. We may observe in the first place that the question is somewhat nugatory, since the individual never becomes directly aware of the inversion or, it may be, even of the existence of the physical image in his own retina; and secondly, that the individual has come strongly to associate, by experience, the top of an object with the act of looking up in order to see it, and vice versa. Any increase in the magnitude of the retinal image is generally associated with approach of the object, and in the exceptional cases in which this result can be brought about by means of lenses, even where the real distance is increased, the object seems to approach; this seeming to approach being the result of an unconscious process of reasoning. The mind, on the basis of tactile experience, interprets any given object as being of a known or ascertained size; if it comes to look larger, it is inferred that it has come nearer.

**Visitation,** in the Anglican Church, an annual assembly, chiefly of clergy and church wardens, called together at one or more convenient centers for the purpose of admitting church wardens elect to office, of receiving presentments, and of officially reviewing the condition of parishes, and of the diocese or archdeaconry, in a charge by the bishop or archdeacon, founded on answers to the inquiries of the bishop to the clergy, and of the archdeacon to church wardens, and frequently embodying digests of recent acts of Parliament bearing on subjects of interest to the Church. The archdeacon holds his visitation annually, but delivers no charge when the bishop is "on visitation;" the bishop, for the most part, triennially. These assemblies are always very largely attended by the clergy, and much more by church wardens than was the case a few years since.

In international law, the act of a naval commander who visits or enters on board a vessel belonging to another state, for the purpose of ascertaining her character and object, but without claiming or exercising the right of search. The right of performing this act is called the Right of Visit, or Right of Visitation.

**Visitation of the Sick,** in ecclesiology, an office of the Anglican Church for the comfort and consolation of sick persons. It is founded on the offices of ancient liturgies, omitting the formal procession of the priest and his clerks to the house of the sick, the saying of the Penitential Psalms, and the anointing with oil. With these exceptions, it is substantially the same as Extreme Unction. The form for anointing was inserted in the Prayer Book of 1549, but was omitted in that of 1552.

**Visitation, Order of the,** an order of nuns, founded at Annecy, in 1610, under the direction of St. Francis de Sales, then Bishop of Geneva, by St. Jane Frances de Chantal. As the object of the bishop was to make it possible for invalid ladies to join this new body, the rule, which was a modified form of the rule of St. Augustine, included few corporal austerities. At first there was no inclosure, so that the nuns could visit the sick in their own homes; but the rule of inclosure was adopted in 1618.

**Visitation of the Virgin Mary,** in ecclesiology, a festival, celebrated on July 2, instituted in the middle of the 14th century by Pope Urban, to commemorate the Virgin's visit (Luke i: 39–56) to Elizabeth, the mother of John the Baptist.

**Vismia,** in botany, a genus of *Elodeæ;* trees or shrubs, with quadrangular branches, opposite entire leaves, sometimes with glandular dots, and terminal cymes of yellow or greenish flowers. Sepals five or four; petals as many, usually villous on the inside, and with black glandular dots; stamens many, in five bundles; fruit a berry,

with five cells and many seeds; known species more than 20, the majority from tropical America, the rest from tropical Africa. *V. guianensis* is a small Mexican and Guianan tree, about eight feet high, with ovate-lanceolate acuminate leaves, dilated at the base, smooth above, rufous beneath. The bark, leaves, and fruit, when wounded, yield a gum resin, called in commerce American gummi-gutta, which, when dry, becomes hard and resembles gamboge. It is given in medicine as a purgative. *V. micrantha* and *V. laccifera* also yield a drastic gum resin like gamboge.

**Vison,** a genus of carnivorous quadrupeds included in the *Mustelidæ* or weasel family. Of this genus the mink (*V. lutreola*) is the most familiar example. It inhabits Northern Europe and Northern America, attains a length of a foot and a half or rather less, and is of a brown color, marked with white on the chin and jaws. The **vison** swims with great ease, the feet being slightly webbed. The fur is very valuable.

**Vistula,** the largest river that flows into the Baltic; rises in Austrian Schlesien, on the N. slopes of the Bieskiden, and is formed by the union of the Black, the White, and the Little Vistulas (Biala, Molinka, and Czorna). It flows N. to the village of Vistula, where it forms a waterfall 190 feet in height, then through a rocky valley to the town of Schwarzwasser, where it leaves the mountain land. It next separates Prussian Schlesien from Austrian Schlesien and Galicia, and after receiving the Przemza, flows N. E., passing Cracow, and separating Galicia from Poland as far as Sandomir, where it receives the San, and turns N. N. W., then W., across the great plain of Poland, passing Warsaw, Nowo Georgiewsk, and Plock, and receiving the Pilica and Bug. Near Thorn it enters Prussia, and continues a N. W. course till it receives the Brahe below Bromberg, where it turns sharply N. N. E. At Montau, near Marienwerder, it divides into two branches, the smaller of which, called the Nogat, discharges into the Frische Haff, while the larger or W. branch, after flowing 40 miles further, again divides at Fürstenwerder into two branches, the smaller or E. falling into the Frische Haff, and the main branch turning W. and falling into the Baltic at Weichselmunde, 3 miles N. of Danzig. The total length of the Vistula is 694 miles.

**Vit, Vincenzo de,** an Italian Latinist; born in Padua, Italy, in 1811. He was an ecclesiastic by profession, was a canon of Rovigo, and town librarian, when in 1850 he joined the brotherhood of Rosmini. On his jubilee in 1888 Leo XIII. sent him a gold medal. He edited Forcellini's "Complete Latin Lexicon" in six volumes, and wrote a supplemental seventh volume, giving in 1,000 pages in double columns all the words in recently discovered inscriptions or codices. His minor writings on history, archæology, and philology have been collected in a uniform edition published at Milan and Florence. His greatest original work is the "Onomasticon," or "Namebook," containing all proper names down to the 5th century. Thirty-six years' labor had just brought him to the end of O, closing the fourth volume, when he died, Aug. 17, 1892.

**Vitaceæ,** or **Ampelideæ,** a small natural order of polypetalous dicotyledons, consisting of climbing plants with alternate simple or compound leaves; a small calyx; petals valvate in bud; stamens opposite the petals; fruit a berry with one or a few hard seeds. Besides the great genus *Vitis* (see VINE), which now includes the genera *Cissus* and *Ampelopsis*, the order comprises the small genus *Pterisanthes*, and the somewhat anomalous genus *Leea*. The Virginian creeper (*Ampelopsis hederacea*), a rapid-growing creeper, native of the United States, is often planted to cover walls, to which it attaches by sucker-like disks terminating the tendrils. Its leaves turn red in autumn, when the plant presents a very striking appearance.

**Vital Principle,** in biology, the principle which, in association with matter, as in organized bodies, controls its manifestations and properties. Nothing is known of it, except as a force in connection with organization.

**Vital Volume,** or **Vital Capacity,** in physiology, Dr. Hutchinson's name for the quantity of air expired from the lungs after the most complete inspiration. It always increases with stature, and is measured by the spirometer.

**Vitascope.** See BIOGRAPH.

**Vitebsk,** a province of Western Russia, surrounded by Pskov, Smolensk, Mohilev, Minsk, Vilna, Courland, and Livonia; area, 16,983 square miles; pop. (1909) 1,800,900. The surface is in general hilly; in the depressions are numerous marshes and more than 2,500 lakes, of which the largest are Lubahan, Rasno, Nevel, Sebesh, and Osvea. The chief rivers are the Duna, Mesha, Kasplja, Ulla, Drissa, and Evst. The soil is far from fertile, and the harvests, except under the most favorable conditions, are insufficient for the wants of the population. The principal occupations are agriculture, cattle rearing, hunting, and fishing, besides tanning, weaving, and the manufacture of brandy and tobacco. Flax, linseed, hides, building timber, and fancy wares are exported.

VITERSK, capital of the province, lies on both sides of the Duna, 79½ miles N. W. of Smolensk. It has more than 30 churches (6 Roman Catholic), 2 synagogues, an old palace, a theater, a gymnasium, and an hospital, manufactures of mead and leather, and an active transit trade. Pop. (1897) 66,143.

**Vitellin.** See GLOBULIN.

**Vitellius, Aulus,** a Roman emperor; son of Lucius Vitellius, the consul (34); born A. D. 15. At that dark period of Roman history vice and not virtue was the passport to royal favor, and the son like the father was a master of the arts of servile cringing and abject flattery. To these he owed his rapid rise and his favor with Tiberius, Caius Caligula, Claudius, and Nero. On the death of Galba he was proclaimed emperor by the soldiers at Köln, Jan. 2, 69 A. D., and having crushed his rival Otho he secured undisputed possession of Italy. Though undoubtedly a man of low character, he did not proceed to extreme measures against the adherents of his rival. His chief passion was sensual gluttony, and he spent enormous sums of money in eating and drinking. Vespasianus revolted and was proclaimed emperor July 1 at Alexandria, and Antonius Primus declared for the new emperor and hastened into Italy at the head of a powerful force. He defeated the generals of Vitellius twice and entered Rome on Dec. 21 or 22, 69. The fallen emperor was seized, dragged with every mark of ignominy through the streets, and murdered

AULUS VITELLIUS.

**Vitellus, or Yolk,** the name given to a part of the eggs or ova of animals. It varies in form and size in different eggs, some being "large-yolked," and others "small-yolked." The hen lays a large-yolked egg, the embryo being developed from a mere speck on the surface, named the cicatricula or tread. The name vitellin was formerly given to the essential substance of which the vitellus was believed to consist, but this substance has been shown to be merely a form of albumen and casein, and not a special product of organic chemistry. The vitellus consists of highly-concentrated protoplasmic or albuminous matter, along with mineral substances, and it contains the nutritive matter from which the early tissues of the embryo are formed. In many respects the egg yolk resembles milk in its nature.

**Viterbo,** a town of Italy, province of Rome; 42½ miles N. W. of the city of Rome. It lies to the N. of the Ciminian forest, and is surrounded by fortifications erected by the Lombards. Of its 17 churches, the chief are the cathedral of St. Lorenzo, founded in the 12th century, and the much-venerated church of St. Rosa, containing the mummy of a saint. In the former, an Englishman, Pope Hadrian IV., made the Emperor Friedrich I. hold his stirrup in token of homage. Other interesting buildings are the bishop's palace, the Palazzo Publico, with a museum, and the Palazzo Vescovile, where between 1261 and 1281 six papal elections took place. Viterbo used to be called "the city of beautiful fountains and beautiful maidens." Of the former the finest are the Fontana Grande (1206), and another in the court of the Palazzo Publico. There are some manufactures of leather, paper, playing cards, lucifer matches, soap, etc. In the neighborhood are the Bulicame sulphur springs, and 10 miles to the W. the great Etruscan cemetery city of Castel d'Asso. Pop. (1901) 21,258.

**Vitet, Ludovic** (vē-tā'), a French author; born in Paris, Oct. 18, 1802. While a journalist on "L'Univers," he wrote three dramatic poems, "The Day of the Barricades" (1826), "The States of Blois" (1827), and the "Death of Henri III." (1829), which gave him reputation. In 1845 he became a member of the Academy. Subsequently he held official posts till the revolution of 1848. Of his later works the best known are: "Fragments and Medleys" (1846), artistic, literary, and archæological criticisms; "Studies of the History of Art" (1864); "Letters on the Siege of Paris" (1870–1871). He died in Paris, June 5, 1873.

**Vitex,** in botany, the typical genus of *Viticeæ*; calyx short, campanulate, five-toothed; corolla irregular, five-lobed, somewhat labiate; stamens four, didynamous; fruit a globular berry, covered at its base by the calyx, and containing four one-seeded cells. *V. agnus-castus* is the chaste tree, a native of Southern Europe. It has digitate leaves, with five to seven leaflets, fragrant flowers, and globular fruits with an acrid and aromatic taste. *V. trifolia*, the wild pepper, is a small tree or shrub, wild in India and Burma. The roots yield a sweet, greenish oil. It is believed that an oil can be extracted also from the seeds. The plant is anodyne, diuretic, and emmenagogue. *V. negundo* is a shrub with pretty blue flowers, found in India, Ceylon, and Cochin China. Its ashes are largely used as an alkali in dyeing. A pillow stuffed

with the leaves is said to relieve headache, and a vapor bath prepared with them is employed in Mysore in fever, catarrh, and rheumatism. The bark and roots of *V. leucoxylon*, a large deciduous tree from India and Burma, are astringent; its fruit is eaten by the Burmese.

**Vitis,** in botany, the typical genus of the tribe *Viteæ* and the order *Vitaceæ*; calyx generally five-toothed; petals five, cohering at the tip, falling off without separating; stamens five; style wanting; berry two-celled; cells four-seeded, the seeds often abortive; climbing plants with tendrils opposite the leaves, which are either simple, undivided, or lobed, or are compound; natives of Asia and North America. *V. vinifera* is the vine, popularly known as the grapevine. *V. indica*, which grows in the W. of the peninsula, from the Konkan S., has a round fruit about as large as a currant. *V. lanata*, from the Himalayas, etc., has purple fruit the size of a pea. The leaves and young shoots of *V. quadrangularis*, another Indian species, are powdered and given by the Hindus in bowel complaints. Every part of *V. setosa*, also from India, is acrid, and the leaves toasted and oiled are applied in India to indolent tumors to bring on suppuration. In palæobotany, there are three species in the Miocene.

**Vitoria,** a town of Spain; capital of the province of Alava; 65 miles N. E. of Burgos. The chief buildings are four parish churches, a palace of deputies, an academy of music, theater, and prison. The manufactures comprise paper, cabinet work, carriages, earthenware, etc. Here, on June 21, 1813, Wellington defeated the French under King Joseph and Marshal Jourdain. Pop. (1900) 30,701.

**Vitré,** an ancient town of Brittany, in the department of Ille-et-Vilaine; on the Vilaine; 24 miles E. of Rennes. It is still surrounded with ramparts, and contains the ruined castle of the Tremouilles. Rochers, the residence of Madame de Sévigné, is 3½ miles S. Manufactures of cloth and hats are carried on. Pop. (1901) commune, 10,775.

**Vitreous Body or Humor,** a body or humor occupying the center of the eyeball. It is of gelatinous consistency, is quite pellucid, and constitutes four-fifths of the eyeball. It is surrounded except front by a hyaloid membrane.

**Vitreous Rocks,** a class of eruptive rocks having glassy luster, conchoidal fracture, and only single refraction. They are obsidian, pitchstone, perlite, pumice, and tachylyte.

**Vitrified Fort,** a kind of prehistoric hill fortress, principally found on the crests of hills in the Scotch Highlands, but occurring also in France, the walls of which are partially or entirely transformed into a glassy substance. The Scotch vitrified forts were first made known, in 1777, by John Williams, a civil engineer, who was then conducting mining operations in the Scotch Highlands. At first the vitrified masses were supposed to be of volcanic origin, but they are now acknowledged to be fortifications. Their vitrification seems to have been intentional, and to have been facilitated by the employment of rocks easy of fusion, such as granite, limestone, etc., these being often brought from a distance when less fusible rocks might have easily been obtained from the vicinity.

**Vitrina,** in zoölogy, the glass snail; a genus of *Helicidæ* with 87 species, most abundant in N. parts of the Old World. Shell imperforate, very thin, depressed; spire short, last whorl large; animal elongated, too large for complete retraction into shell. The species are occasionally animal feeders, like the slugs.

**Vitriol,** a commercial name for sulphuric acid, and for several salts which that acid forms. The term vitriol was in common use among the alchemists, and was derived from vitrium, "glass," on account of the glassy appearance and transparency of copperas or green vitriol (the sulphate of iron). From copperas the alchemists prepared a strong sulphuric acid by distillation, whence also the acid was termed the oil of vitriol. In addition to these there is yet commercially known blue vitriol, which is a sulphate of copper, and white vitriol, the sulphate of zinc (zinci sulphas of the "Pharmacopœia") much used in medicine.

**Vitriolate,** to convert into a vitriol, as iron pyrites, by the absorption of oxygen, which reduces the iron to an oxide and the sulphur to sulphuric acid. Thus, the sulphide of iron, when vitriolated, becomes sulphate of iron, or green vitriol.

**Vitruvius, Pollio,** a Roman architect of the age of Augustus; celebrated as the author of the only Latin treatise on architecture which has come down to modern times. Of the details of his life but little is known, and that little is due to incidental allusions in his own work. That he was fairly well acquainted with Greek and Latin literature; that he served as a military engineer in Africa; that he obtained the direct patronage of the reigning emperor (Augustus, according to the consent of modern scholars, but Titus, according to an older opinion advocated by Newton); and that he composed his treatise in his old age to guide the judgment of his patron in matters of architecture — are the principal facts that are thus preserved. The "Architecture" was probably completed 14 B. C. Besides the subjects strictly included under the title, it treats of water and aque-

ducts, sundials, and machines. The style is a very bad one; at times perplexingly diffuse, and again as perplexingly curt, with an almost total absence of true literary grace; but the matter is of great value as being largely an epitome of treatises by Greek architectural writers. The authoritative MSS. are the Harleian of the 9th century and the Gordianus of the 11th. The first edition was by Sulpicius at Rome between 1484 and 1492; and the best of recent editions is by Reber (Stuttgart, 1864).

**Vitus, St.,** a reputed martyr under Diocletian, the son of a Sicilian pagan, but converted by his nurse Crescentia and her husband Modestus. All three perished together, in Lucania or at Rome, the festival falling on June 15. The relics of St. Vitus are preserved at Corbey and at Prague. He is invoked against sudden death, hydrophobia, prolonged sleep, and the complaint commonly called the chorea or dance of St. Vitus; some authorities make him also the patron of comedians and dancers. It is said that in Germany in the 17th century it was a popular belief that good health for a year could be bought by bringing gifts to his image and dancing before it on his festival — a practice especially in vogue at his chapels at Ulm and Ravensberg.

**Vitus's Dance, St.** See CHOREA.

**Vivandiere,** a woman attached to French and other European continental regiments, who sells provisions and liquor. The dress of the vivandieres is generally a modification of that of the regiment to which they are attached.

**Viverra,** the civet cat; the type genus of *Viverridæ*, with the range of the family. Body elongated and compressed; head pointed in front, ears rather small; extremities short, feet small and rounded; toes short, five on each foot; tail moderate or long; a pair of large glandular follicles, situated on the perineum, in both sexes and secreting in most species an oily substance of a penetrating odor. All the species are extremely active, fierce, and rapacious, and feed chiefly on small mammals and birds. The genus is an extensive one, and is often divided into groups, to which some naturalists give generic rank. The chief are (1) *Viverra* proper, including the largest species. Fur rather long and loose, and elongated in the median line of the neck and back, so as to form a sort of crest or mane. (2) *Viverricula*, and (3) *Genetta*, containing smaller species, differing slightly from the first group in dentition.

**Viverrine Cat,** the *Felis viverrina*, a large tiger cat, from India. Ears small and blunt, fur coarse and dull, limbs short and strong; snout narrow, and drawn out like that of a civet, whence the specific name; color gray, lighter beneath, banded and spotted with black. The skull is remarkable from the fact that the orbit is completed behind by bone, which is quite exceptional among the Carnivora.

**Viverrine Dasyure,** in zoölogy, a variety of *Dasyurus maugei* from New South Wales and Van Dieman's Land. General color black, brown, or gray; head and body spotted with white, under parts white.

**Viviania,** in botany the typical genus of *Vivianiaceæ*; undershrubs with opposite ovate leaves, covered beneath with white down, and terminal panicles of white, pink, or purple flowers. Natives of Chile and Brazil.

**Vivianiaceæ,** vivianiads; an order of hypogynous exogens, alliance Malvales; herbs or undershrubs, with opposite or whorled, exstipulate leaves, often hoary on their lower side with down. Flowers in panicles or corymbs, white, red, or pink. Calyx ten-ribbed, with five divisions; petals five, with claws often remaining, after withering around the ovary; stamens 10; filaments distinct; anthers two-celled; stigmas three, sessile; ovary free, three-celled; ovules two in each cell, one ascending, the other suspended; capsule three-lobed, three-celled; seeds roughish. Natives of Chile and the S. of Brazil. Known genera 4, species 15.

**Vivianite,** a mineral crystallizing in the monoclinic system, but sometimes occurring in an earthy form; hardness, 1.5–2; sp. gr. 2.58–2.68; luster on cleavage faces pearly, others vitreous; colorless when pure, but, owing to the rapid oxidation of the iron, changing to blue or green; transparent to translucent. Composition: Phosphoric acid, 28.3; protoxide of iron, 43.0; water, 28.7 = 100, which is equivalent to the formula $3FeO,PO_5 + 8HO$.

**Vivien de St. Martin, Louis,** a French geographer; born in St. Martin-de-Fontenoy, France, May 17, 1802. He was one of the founders of the Paris Geographical Society, and from 1863 to 1876 edited the "Geographical Year," an annual review of geographical exploration. He wrote: "Description of Asia Minor" (2 vols. 1845); "Study on the Grecian and Roman Geography of India" (3 vols. 1858–1860); "Study on the Geography of the Primitive Peoples of Northwestern India according to the Vedic Hymns" (1860); "The North of Africa in Grecian and Roman Antiquity" (1863); "New Dictionary of Universal Geography" (1876–1893); "Universal Atlas of Geography, Modern, Ancient, and Mediæval" (1877). He died Jan. 3, 1897.

**Viviparous Blenny,** in ichthyology, the *Zoarces viviparus*, a species about a foot long, common on the European side of the

Atlantic, ranging into the German Ocean and the Baltic. The female produces her young alive, and these are so well developed at their birth that they immediately swim about almost as boldly as the adults. From 200 to 300 are produced by one female, and directly before parturition the abdomen is so distended that it is impossible to touch it without causing some of the young to be extruded.

**Viviparous Fishes,** fishes, the females of which produce their young alive, as the result of actual congress, the males in most cases being furnished with intromittent organs. Among these are many of the *Chondropterygians*, the families *Embiotocidæ*, many of the *Blenniidæ* and *Cyprinodontidæ*, and several *Lophobranchs*.

**Viviparous Lizard,** the *Lacerta vivipara*, a European species, from four to six inches long. The colors and markings vary greatly; the general ground tint of the upper parts is a greenish-brown dotted with black; the under surface in the male bright orange spotted with black, in the female pale grayish-green.

**Vivisection,** a term denoting, in its strict signification, the dissection of living animals, but popularly employed to denote the practice of performing operations with the knife on living animals, with the view (1) of increasing physiological knowledge; (2) of converting speculative into positive conclusion; and (3) of acquiring manual dexterity in operative surgery. In this last sense vivisection is principally confined to the French veterinary schools. By biologists the term is extended to include the performance of all scientific experiments of a kind calculated to inflict pain on living animals, and having for their object the investigation of the laws which govern life, the processes of disease, the action of heat and cold, poisons, and therapeutic remedies. The practice appears to have been introduced by the Alexandrian school in the 4th century B. C.; and to this practice we owe, among many other benefits, the discovery of the circulation of the blood by Harvey; the treatment of aneurism by ligatures by Hunter; the distinction of the sensory and motor nerves by Bell; the introduction of chloroform; and the improved treatment of cerebral diseases which resulted from the researches of Brown-Sequard and Bernard. Among the chief investigators by this method of research at the present day are Burdon-Sanderson, Greenfeld, and Klein, in England; Pasteur in France, and Koch in Germany.

Vivisection has met with vigorous and organized opposition in Europe as well as in the United States, where bills have been brought before various legislatures for the restriction or abolition of the practice. On Feb. 21, 1900, a Senate Committee gave a hearing in Washington, on a bill "For the Further Prevention of Cruelty to Animals in the District of Columbia," prominent professional men and officials appearing on both sides. The proceedings were afterward published. President Eliot of Harvard is one of the leading advocates of vivisection in the United States, basing his arguments on the great advances made by its means in medical science in recent years. He objects, however, to its use in secondary schools or before college classes for the purpose of demonstration only. In England, the passage of the "Cruelty to Animals Act" of 1876 legalized vivisection with restrictions according to which it must be performed under license, the only experiments allowed without anaesthetics being such as inflict no pain greater than the prick of a needle. The "London Anti-Vivisection Society," founded in 1876, has worked actively for the abolition of the legalizing act.

**Vivisection: Its Influence on Surgery.** It is my purpose to write in the following pages, as the above title indicates, a brief résumé of the influence of vivisection on the progress of modern surgery. I shall do so as briefly as I possibly can, stating only facts which are generally well known to surgeons, but of which the general public of necessity must be ignorant to a great extent. Most of the facts below stated are known to me personally, as they have occurred during my professional lifetime; and I can, therefore, vouch for their accuracy.

If a physiologist were asked to contribute a similar paper he would be able to tell a similar story as to the revelations of the functions of various organs in the human economy obtained through vivisection; if a professor of pharmacology (*i. e.*, the action of drugs upon the living body) were to write a similar paper he would be able to show an equal debt owing to animal experimentation, first in giving us an exact knowledge of the action of drugs, and, secondly, in the introduction of a large number of new drugs. In this way cocaine was introduced into medicine and the proper use of such a powerful drug as digitalis was shown.

If a medical man were to write a similar chapter he would scarcely know where to begin. The whole life history, for example, of the trichina has been studied in animals and the results applied to man, so that if every one would heed the warning no one need die from the trichina worm in pork. This has had also an enormous commercial value, since all our hog products are exported on condition that the trichina be exceeded by microscopical examination. In diphtheria the percentage of deaths has been reduced in Baltimore from about 70 per

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cent. to about 5 per cent. The saving of human life in a single year in New York has been 1,500. All this is due to the antitoxin of diphtheria, which has been evolved almost solely as a result of animal experimentation.

Two water companies in London in 1853 experimented on 500,000 human beings, and, as a result of the cholera, one of them killed 3,476 human beings. In that same year Thiersch, in Liepsic, experimented on 56 mice. Had the lesson of these few mice been heeded the lives of these human beings might have been saved. More than that, even at the present day, as a result of Koch's discovery of the cause of cholera, Haffkine, in India, is making protective inoculations which are proving of the greatest value. By the same method we have recently discovered that the bubonic plague is spread by rats, and that efficacious vaccines can be used against this dreadful disease; that the malarial parasite is spread by mosquitoes, as proved by studies both in birds and in human beings; and the preventive inoculations against typhoid (as yet in the early stage of their use) have been discovered by the same means.

Let me give one illustration of the method by which the cause of one disease — tuberculosis — was proved. Similar methods are employed in tracing the causes of others. In a case of consumption of the lungs the expectoration is examined by the microscope after applying a staining material. Without staining the tubercule bacilli are so translucent (like little rods of jelly) that we can scarcely see them. Having found this peculiar germ in the expectoration, some of the material is injected under the skin of a guinea pig. After a certain time the animal either dies or is killed, and a post-mortem examination is made. If there are found in the body of the guinea pig little nodules — *i. e.*, tubercles (little tubers) — these are examined by the same method and the same germs will be discovered and can be obtained in a pure culture. But the circle of proof is not yet complete. A small portion of this pure culture of the germs obtained from the inoculated guinea pig is again injected into another animal, and if the second animal suffer from a similar disease and the same germ be found again, the conclusion is irresistible that the cause of the tuberculosis is the peculiar germ always found in such cases.

I well remember the incredulity with which I first read of the origin of lockjaw from the soil, but very soon this incredulity was changed to belief in the face of absolute demonstration after this fashion: It had been well known for years that hostlers, cavalrymen, farmers and persons who were engaged in any occupation about horses were peculiarly liable to lockjaw. After the discovery of the bacillus of lockjaw in 1884, by Nicolaier, when a case of lockjaw occurred, the ground on which the patient had fallen, or the instrument by which he had been hurt, was examined, and a certain bacillus was found in or on it. This was inoculated into animals, and was found to produce the same disorder; and the same bacillus was recovered from the animal's body and was reinoculated. The circle of proof, therefore, was complete. This explained the popular belief that treading on a rusty nail is a frequent cause of lockjaw; not because it was a nail or old or rusty, but because the germ of lockjaw was on it and in the ground in which it was lying. No such exact experiments are justifiable on man. The sacrifice of a few rats quickly gave us all the desired information. This has abolished lockjaw as a result of surgical operations, and enabled us to cure it in many cases even after accidental inoculation. Before 1884 it was both frequent and fatal; now it is almost a surgical curiosity, except after neglected accidents.

The two most important surgical discoveries of the 19th century were: (1) anesthesia, especially by ether (in 1846) and by chloroform (in 1847); and (2) antisepsis, by Lord Lister, who began his work soon after the middle of the 19th century and had distinctly formulated it about the end of the sixties. His remarkable paper in "The Lancet" of April 3, 1869 (when he was simply Mr. Lister, Professor of Surgery in the University of Glasgow), was one of those papers which marked a new era in surgery. Several years before he had announced that he believed that inflammation and most of our surgical disorders were due to germs, and that if we could exclude these germs we would be able to secure the healing of wounds without inflammation and without the formation of pus (matter); yet it was not until 1881 that Ogston and Rosenbach discovered the germs which produce the terrible results of inflammation, such as erysipelas, hospital gangrene (what irony in the name!) abscesses, blood poisoning and even death.

*Hemorrhage.*— One of the most important contributions by Lister to the progress of surgery was the introduction of antiseptic threads (ligatures) of catgut, with which to tie blood-vessels. One of the earliest Philadelphia surgeons, Philip Syng Physick, tried to get rid of the dangers following silk, which had been used to tie arteries ever since Ambroise Pare introduced it in the 16th century as a happy substitute for the horrible hot pitch and hot iron which then were the only means for arresting hemorrhage. Physick sought to use buckskin, on the ground that it was an animal substance and would, therefore, disappear by absorption. Dorsey used catgut. Hartshorne used parchment cut in fine threads, and Bellinger and Eve the tendon of the

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deer. But none of these surgeons succeeded in giving us harmless ligatures until Lister taught us how to use them. In the paper to which I have referred he showed that the old idea of a ligature was that it was a foreign body which was to be got rid of by its rotting through the walls of the blood-vessel. The result was that in a very large percentage of cases the blood-vessel was not stopped by a clot; secondary hemorrhage took place (usually during the second week after an operation), and many a patient bled to death.

I shall never forget one night in the Satterlee Hospital, of West Philadelphia, about 10 days after the battle of Gettysburg, when I was called five times to check just such secondary hemorrhage from the rotting through of silk ligatures. As a consequence of the introduction of antiseptic ligatures by Lister I do not recall in the last 20 years five cases similar to these five that I then attended in one night. In other words, secondary hemorrhage has almost disappeared from surgical experience.

How did Lister find out the proper method of tying an artery? On Dec. 12, 1867, he tied the great carotid artery in the neck of a horse with a piece of pure silk saturated with a strong watery solution of carbolic acid, cutting both ends of the thread short and dressing the wound antiseptically. Healing took place without any inflammation. Six weeks after the operation he investigated the parts by dissection, and found that if the thread had not been applied with the antiseptic precautions secondary hemorrhage would unquestionably have occurred, and in all probability the animal would have bled to death. On Jan. 29, 1868, he applied this principle in the case of a woman of 51 with an enormously dilated sac (an aneurism) in the upper part of the great artery supplying the thigh and leg. She, like the horse, recovered without inflammation, and lived for 10 months. On Nov. 30 she suddenly died as the result of a rupture of a similar dilation of the aorta in the chest. This gave Lister the unusual opportunity of examining in a human body the result of his application of an antiseptic thread to the arteries. The case emphasizes one of the great difficulties in studying such questions on human beings. The opportunity for a post-mortem examination after such an application of a new principle can only be occasional. If this woman at the time of her death had been under the care of some other surgeon than Lister no such careful examination of the consequences of the tying of the artery would have been made, and no further progress would have followed. The result of his examination showed that in spite of his care an incipient abscess was developing at the point at which he had tied the artery. This was in consequence of the presence of the thread, and especially of the knot.

As a result of this investigation, on Dec. 31, 1868, he tied the carotid artery in the neck of a calf with catgut which had been prepared with carbolic acid, and all antiseptic precautions were used during the operation. The calf recovered perfectly, and in 30 days was killed and the parts dissected. He found that at the site of the thread of catgut there was a band of living tissue surrounding the thread and closing the artery, and that, therefore, instead of the thread rotting through, as was the case with the silk, it had become a part and parcel of the tissues. The artery, instead of being so weakened as to allow of secondary hemorrhage, was really stronger at this point than at other points. The ligature and the knot had entirely disappeared.

I have narrated this somewhat in detail for this reason: It illustrates admirably the method of scientific progress by experiment upon animals. Neither of these animals suffered any material pain, both operations having been done with the same antiseptic care as in a human being. Both of them were killed at such a time as would facilitate our knowledge of the results.

Since then other experimenters have tied the blood-vessels in animals and have killed them at varying intervals and made microscopical examinations of the blood-vessels. In this manner our knowledge of the way in which hemorrhage is stopped is now complete. The knowledge which was attained within a short time by the sacrifice of a few animals would have been attained only after many years by occasional post-mortems, and would then have been very much less perfectly attained and only by the loss of many human lives instead of a few animals' lives.

Contrast, now, the result of the old and the new surgery in the mere matter of stopping hemorrhage after operations or accident by tying blood-vessels with the old ordinary silk and the modern antiseptic catgut, or with silk itself as now used by improved methods. In the old way the blood-vessels were tied with silk, which was as clean as an ordinary housewife would have it. One end was left long, and it was no uncommon thing after an amputation of the thigh to have as many as 20 or 30 of these ligatures or threads hanging out of the wound. After two or three days, when those on the smaller blood-vessels would, possibly, be rotted through, each ligature was pulled upon, and those that were already loosened by putrefaction came away. Finally, at the end of 10 days, two weeks or three weeks, the ligature on the great blood-vessel of the arm or thigh came away, not uncommonly followed, as has been stated, by profuse and often fatal hemorrhage. Sometimes, as in Lord Nelson's case, such a ligature did not rot away for years,

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and required dressing of the arm all of this time on account of the constant discharge.

What happens today in a surgical operation where either properly prepared silk or catgut is used? We tie all the blood-vessels needing it, cut off both ends of the threads short and close the wound entirely; and, instead of having discharge and horrible inflammation for days and often weeks and sometimes months, it is now a rare thing for such a wound not to be entirely healed within 10 days, and sometimes less, and secondary hemorrhage is almost unheard of. If vivisection had given to surgery only the modern means of stopping hemorrhage it would be worth all the labor it has required and all the suffering it has inflicted on all the animals ever experimented upon.

Of late a new problem in hemorrhage has been presented. When an artery is wounded — as, for instance, if the blade of a pocket knife has been thrust into the thigh and wounds the great femoral artery — the only way to prevent the patient's bleeding to death has been to expose the artery and tie it above and below the point where it was cut. Of late several surgeons (especially Murphy, of Chicago) have made some very ingenious experiments on such wounded blood-vessels. They have carefully exposed the artery of an animal (under an anesthetic, of course), have wounded it, and then, instead of tying the artery, have sewed up the wound in the wall of the artery to see whether this could not be done successfully. The reason for this series of experiments is this: When we cut off the supply of blood to a leg or an arm by tying the blood-vessel, gangrene not uncommonly occurs, because the chief blood supply of the limb is cut off by tying the artery. If instead of tying the vessel we can sew up the wall and it will heal, the current of blood is uninterrupted and there is no danger of gangrene. One thing is perfectly manifest — it would never be proper to make such experiments on human beings. Human life would be endangered, and no surgeon would adopt or would be justified in adopting such a novel procedure until it had been tried and proved successful on animals. Several successful cases of suture (sewing) of the large blood-vessels have now been done in man.

*The Brain.*— When I first taught anatomy, 35 years ago, the various portions of the brain were not supposed to have separate functions. We knew, of course, that disease or an injury on one side of the head produced paralysis on the opposite side of the body. Broca also discovered by observations on man in actual cases of disease that when that part of the brain corresponding to the left temple was affected the power of speech was lost. But if a man had a fracture of the skull or a gunshot wound in the region above the ear or in the front of the brain or the back of the brain, there was no well recognized difference in the results. This was largely due to the fact that such injuries are widespread, and not limited to small areas. In Germany Fritsch, Hitzig, and Goltz, and in England Horsley, Ferrier, Schaeffer and others, pursued the following plan: The monkey's brain is the nearest in similarity to man's. A known portion of the brain — for instance, the region above the ear — being exposed, the brain was mapped out in small squares and each one of these squares in succession had the pole of a battery applied to it. The phenomena which occurred — whether opening and shutting the eyes, turning the head right or left, contraction of the muscles of the arm or leg — were all carefully noted down. In this way a distinct map of the brain was made, so that we know definitely that a certain area of the surface of the brain governs the movements of the eyes, of the head, of the arm, forearm, hand, thumb, thigh, leg, great toe, etc. In the same way at the back of the head the area which governs sight has been found, and it was discovered that the area on the right side if destroyed made the right half of each eye blind, and that if the area of the left side was destroyed the left half of each eye became blind. This description is, probably, sufficient to indicate how physiologists and surgeons have investigated the brain.

The following is an instance which shows how accurately this method has enabled us to locate the motor centers in the brain: A girl who suffered from epilepsy and in whom the convulsions always began in the right thumb, and then spread to the arm and the body, was operated upon. A piece of the gray matter of the brain, as large as the last joint of the forefinger, was removed from the place determined upon animals as the center governing the movements of this thumb. When she awoke from the ether that thumb was entirely paralyzed, and no other part of the body. When we remember that the muscles which move the thumb arise in the ball of the thumb, between the thumb and the forefinger and on the front and the back of the forearm nearly as high as the elbow, this is seen to be most remarkable. I do not know a single case ever recorded of so minutely located disease. By no other means than vivisection could this small thumb center have been determined. She has entirely recovered from the paralysis, and her epileptic fits instead of being almost daily were reduced to one or at the most two a year. This has made possible the modern surgery of the brain, which would not exist today were it not for vivisection.

Here and there an unexpected post-mortem examination, as in the case of Lister's woman patient, has given us some special information, but nine-tenths if not ninety-

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nine-one-hundredths of our knowledge of cerebral localization is the result of exact experiment on animals. As a consequence of this in 1884, for the first time in the history of surgery, the existence of a tumor of the brain, which was not indicated by anything on the outside of the head, was diagnosticated, its location determined and the tumor removed. When the skull was opened no tumor was visible; but so confident was Mr. Godlee, the surgeon, that he cut boldly into the substance of the brain and there found the tumor which had been so accurately diagnosticated. Since then this first achievement has been repeated not only scores, but hundreds of times, and the net result up to 1898 was that 273 brain tumors had been operated on. Of the patients 169 (61.9 per cent.) had recovered and 104 (38.1 per cent.) had died. At present it can be said that two out of every three recover. This localization of cerebral functions, together with antisepsis, has so revolutionized (or, rather, created) modern cerebral surgery that the principal facts are a matter of common knowledge. Tumors are now attacked not only in what is called the motor area (that is, that portion of the brain governing movement, which, roughly speaking, may be described as lying above the ear), but many times in the front part of the brain, and at the back of the brain, far outside of the motor area. In case the tumor is at the base of the brain, or at certain other parts this knowledge has prevented useless operations which otherwise might have been performed.

It is a source of sincere gratification on the part of numerous surgeons that by this same knowledge of cerebral localization derived from animal experimentation they have been able to recognize hemorrhage inside the skull, open the skull at the right point, even when there was no fracture, and save their patients. Before experiments on animals showed us how to interpret the symptoms this was an impossibility, and nearly all such patients died. Now we save, roughly speaking, two out of three.

Time and space would fail me to tell of the abscesses of the brain, of the foreign bodies in the brain (such as nails driven into it by accident or design, rifle balls which had lodged in it) and of many other similar surgical disorders the modern successful treatment of which depends directly upon the localization of cerebral functions, which is the result almost wholly of experiments upon animals.

*The Spinal Cord.*— Up to the present time the belief of surgeons has been that in case the spinal cord was completely cut in two, either by gunshot wounds, fracture of the spine or otherwise, no reunion of the two ends would take place, and, therefore, there was no possibility of relief for the paralysis below the point of division of the cord which is almost always fatal. Very recently, at the Pennsylvania Hospital, Dr. Stewart had a patient whose spinal cord was cut in two by a bullet. He removed the bone sufficiently to get access to the spinal cord, and found it completely divided. He immediately stitched the two ends together, and, strange to say, this patient has recovered both feeling and motion to some extent in both legs. I think it would be evident to any person that such a totally unexpected result deserves the most careful investigation. In man cases of such complete division followed by recovery are almost unknown; and if they had to be studied in man this would be imperfectly done, and probably would require 15 or 20 years before we would know what ought to be done. It is one of those cases in which it is our duty to investigate by experiments upon animals what is the best method of sewing the two ends of the spinal cord together; at what date after division of the cord it will be hopeless to do so; how much of the cord can be lost (that is to say, a half inch, inch or more) and yet by stitching the two ends together it will be possible to restore the function of the spinal cord. One can see very readily that in animals all these problems can be studied minutely, in a sufficient number of cases; various procedures can be tested and the results determined accurately by killing such animals at a suitable date, and a definite conclusion can be reached in a short time.

In 1888 Mr. Horsley, the distinguished London surgeon, and Dr. Gowers, equally distinguished as a neurologist, for the first time in the history of surgery made a diagnosis of a tumor of the spinal cord, definitely located it and the former removed it, the patient making an absolute recovery. A number of other cases have been successfully operated on since then. Just as in the case of tumors of the brain, this would not have been possible had it not been for experiments upon animals, which have given us practically most of our present knowledge of the minute anatomy and physiology of the spinal cord and have, therefore, enabled us to deal with it surgically.

*Nerves.*— Among the most fruitful branches of research which have been so valuable in results are the animal experiments upon the different nerves of the body. The methods by which nerves could be sewed together; the possibility of taking a portion of a nerve or even of the spinal cord from a rabbit or other animal to replace a piece of the nerve when it has been destroyed by accident or disease; the possibility of sewing one nerve to a neighboring nerve in order to reëstablish its function — all of these and other similar operations have been studied in animals, and could only be studied in animals with exactness.

In order to study such conditions it is not

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enough that the two ends of the nerve should be sewed together and then, after the wound was healed, that we should simply determine the fact that the functions of the nerve are reëstablished. It is necessary to know by the microscope the various steps of the process of union of the nerves — to investigate various methods of sewing them together; whether they can be overlapped, or must be applied exactly end to end; whether one end of the nerve can be split and the other inserted into it, or turned over as a flap, and so on. Evidently numerous methods can only be studied on animals. Then, when the results are known, we can apply them for the benefit of man.

*The Thyroid Gland.*— One of the commonest diseases in Europe, and one that is occasionally seen here, is goiter. This forms a large tumor in the neck, for which formerly little could be done, as an operation was nearly always fatal. Such patients were obliged to go through life with a dreadful deformity, in the greatest discomfort, and were sometimes suffocated by pressure on the windpipe. In consequence of the introduction of the antiseptic method of Lister, which we owe to vivisection more than to any other agency, operations on the thyroid gland are now so common that at the German Surgical Congress Professor Kocher, of Berne, has reported 2,000 operations done by himself, with a mortality of only 4 per cent.

Very soon it was discovered that removal of the entire gland produced a curious effect. The face became bloated; the expression greatly changed, and the patient became more or less idiotic — that is, the condition known as myxœdema followed. This led to improvement in operations in several directions. First, in all those cases in which the tumor could be shelled out, as an English walnut is turned out of its shell, leaving a portion of gland tissue behind, this was done. The similar effects of the removal of the thyroid in animals were studied especially by Mr. Horsley. Surgeons then removed the thyroid gland from the neck of an animal and placed it under the skin of the same animal, and it was found that the disastrous results were avoided. After a number of experiments on animals there was good reason to believe that the disastrous effects of the operation which sometimes followed goiter could be avoided in man by the same procedure. Accordingly the thyroid gland of a sheep was transplanted in a number of instances under the skin, or in some cases into the abdominal cavity. In both cases there was improvement for a time; but eventually the majority of the cases suffered from cretinism or myxœdema, which may be described as a less severe form of the same disease. Finally in animals a study was made to determine how much of the gland must be left in order to prevent myxœdema, and now we are able to relieve patients from goiter and yet, by leaving enough of the gland, prevent any bad results following the operation.

These results led also to a careful study of the effects of giving an extract of the thyroid gland to human beings. Some of the most brilliant results that have ever been obtained in medicine have followed the administration of the thyroid extract to cretins in whom the disease had not been produced by operations for goiter, but arose naturally. In certain forms of goiter it has enabled us to relieve or even to cure without operation. In insanity and many other mental states it is used as a well established remedy, which in even a large percentage of cases is followed by great benefit and often by cure. In many other diseases also the thyroid extract has been used with the best results.

*The Larynx.*— Cancer of the larynx, or that part of the windpipe back of and just below the Adam's apple, is not at all uncommon. The only hope of such patients is in removing the entire larynx or voice box. Before attempting this for the first time on man, Billroth, of Vienna, and his assistant Czerny, now the distinguished Professor of Surgery at Heidelberg, tested the operation on several dogs. Billroth then removed the larynx from his patient and saved his life. This operation has now been successfully repeated scores and scores of times as a result of these few experiments on dogs.

*The Lungs.*— A beginning has been made in the surgery of the lungs, but as yet we have not reached the point where we can say that we have attained entire success. In a number of animals parts of the lungs have been cut out with a view of discovering the possibility of cutting out diseased portions of lung, the seat of tumors, consumption and other disorders, and a few operations have been done upon man, with a fair percentage of success. Not uncommonly abscesses of the lungs which were perfectly inaccessible a few years ago have been reached and opened. Sometimes coins and other foreign bodies get into the bronchial tubes, and can only be reached through most difficult and dangerous operations. Several surgeons have experimented upon animals to determine the safest method of removing such bodies, but with only partial success. Is it not evidently our duty to devise new operative procedures and test them on animals first, and, when a reasonably promising one has been found, to apply it to man?

*The Liver.* — In 1890 Ponfick, of Germany, showed that in rabbits the removal of a quarter of the liver caused a slight deterioration in the condition of the animal; removal of one-half was followed by much more serious symptoms, which, however, passed off within a few days. Even re-

moval of three-fourths of the whole liver could be recovered from, but removal of more than this was always fatal. By killing the animal in which a small part had been removed at a suitable time, and studying microscopically the liver tissue at different periods of time after operation — a procedure manifestly only possible in animals — he showed that there was a reparative power in the liver, which before then was unknown.

Up to that date less than a dozen surgeons had operated on tumors of the liver. In only two of them was any considerable portion of the liver removed. After the paper by Ponfick, which showed how much could be removed, surgeons immediately operated with much more confidence, and removed considerable portions of the liver. Up to 1899, 76 tumors of the liver had been removed. Of these cases the termination of two was unknown; of the remaining 74, 63 recovered and 11 died — a mortality of less than 15 per cent. One who is not a surgeon can scarcely appreciate how differently the operation for tumor of the liver was regarded before and after Ponfick's experiments. Before that everything was marked by timidity; after that everything was marked by confidence, and all to the benefit of the patient.

*The Spleen.* — The same story that has been told of the liver can be told of the spleen, though with much less good results. As a result of studies, partly by accident, in man (as when in consequence of a stab-wound or other injury a spleen would protrude through the wall of the abdomen, and would have to be removed), but chiefly as a result of the careful studies of removal of the spleen in animals, beginning practically with Schindeler's experiments in 1870, we are now in a position definitely to say that in man the whole of the spleen can be removed, and he can not only survive the operation, but get along comfortably without any spleen. A very considerable number of such operations have now been successfully performed.

*The Kidney.* — On Aug. 2, 1869, Professor Simon, of Heidelberg, laid the foundation of the modern surgery of the kidney by removing a healthy kidney from a healthy woman. The reason for it was that in removing an ovarian tumor some time before he had been obliged to remove a part of the ureter (the tube leading from the kidney to the bladder), and to fasten the cut end to the skin. As a consequence of this the woman was in a most deplorable condition from the continual escape of urine over her person. After a number of unsuccessful attempts to close this external opening, it finally occurred to him that the only way to cure her was to remove the kidney on that side. Whether a human being would recover and could live with only one kidney

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was practically unknown. It is true that disease had destroyed one kidney in some patients and the other had gradually developed ability to do the work of both. Injury also had destroyed parts or all of one kidney, but deliberately to take out a healthy kidney from a healthy human being was an operation not only fraught with danger, but one before which all the surgical world up to that time had recoiled. No one had studied the effect on the remaining kidney and upon the heart. No one had carefully determined what was the best method of reaching the kidney — whether through the abdomen or through the loin from the back; what to do with adhesions and many other technical questions. All these had to be settled. Accordingly he experimented on a number of dogs; decided that from these indications a human being could live with only one kidney; studied on the cadaver the best way of doing the operation, and on Aug. 2, 1869, removed this healthy kidney through the loin and saved the patient's life and made her perfectly comfortable. She died in 1877, after eight years of healthy life.

As I have said these new experiments laid the foundation of the modern surgery of the kidney. Now hundreds of kidneys have been removed successfully. Finding this operation so feasible, surgeons were led to practise other operations; some hundreds of abscesses in the kidney have been opened; scores of stones have been removed from the kidneys; floating (*i. e.*, loose) kidney has been sewed fast in hundreds of cases; many cases of tuberculosis of the kidney have been relieved or cured; tumors of the kidney are successfully attacked; even the cut ureter has been spliced and stones removed from it. In a word, Simon's experiments on a few dogs opened to us a new domain in surgery which until then was wholly unknown. Would it not be gross cruelty to man to prevent such beneficent researches?

*The Stomach.* — Until 1875 practically there was no surgery of the stomach. As occasional Cæsarean sections have been done in the past, so occasional operations on the stomach were done when the surgeon was obliged to do them. Now, however, it is a matter of routine procedure, to the vast benefit of the human race. Had vivisection contributed nothing else to the progress of surgery than its services in the surgery of the stomach, this alone would be sufficient to justify it. I may quote from the Cartwright lectures which I gave before the College of Physicians and Surgeons in New York in 1898:*

In 1875 Tschertneisky-Barischewsky cut out a piece of the intestines in 35 dogs, with 29 recoveries — a startling result when compared with the former fatality of such operations. This was the

* In quoting this I have popularized some of the medical terms there used.

starting point in the new gastro-intestinal surgery. The next year Gussenbauer and Winiwarter cut out a piece of the stomach in only seven dogs. We scarcely can appreciate at this day, though these experiments are so recent, how many new questions had to be answered. After their first unsuccessful experiment they naively remark that certain facts were established by the experiment, among them, "that the surfaces of the stomach have a real tendency toward union by first intention, . . . just as do wounds of the skin." (!) Whether this would be correct of man as well as of animals they admitted was as yet uncertain. Another point settled by the experiment was "that there was no digestion of the mucous membrane in the neighborhood of the wound." Their second experiment was followed by recovery, and showed not only that such an operation could be successfully done, but that the narrowing caused by the scar did not interfere with the functions of the stomach, either as to its movement or its secretion of the digestive juices, and that the removal of the pylorus was not followed either by the too early escape of the food into the intestines, or by the reflux of the intestinal contents into the stomach. The dog was killed five months later and the post-mortem showed no contraction, by reason of the scar, and no digestion of the edges, and his perfect health after the operation showed that the movements of the stomach and its digestive functions had not been interfered with. Then, again, the question whether catgut or other suture material was the best, and what kind of a knot and what kind of a suture would best answer were subjects of debate. . . .

Our anti-vivisection friends, who so often declare that experiments upon animals have never contributed anything to the progress of surgical science, may well be challenged to account for the remarkable progress in the surgery of the stomach which immediately followed these fruitful experiments. The dogs that died did not die in vain. They showed the correct methods and indicated errors in technic, and directly led up to the modern surgery of the stomach and the intestine in man, as follows: In the very same year, 1876, Hueter cut out a part of the bowel, though without success. In 1877 Czerny for the first time sewed up the intestine and dropped it into the abdominal cavity, with recovery; followed almost immediately by Billroth, who did the first successful suture of the stomach and total removal of a portion of the bowel. In 1878 Forelli operated for a wound of the stomach, and in 1879 Cavazzani removed a portion of the stomach for tumor. In the same year Pean did the first removal of the pylorus. In 1880 Rydygier did the second, and in 1881 Billroth did the third and first successful one, without a knowledge of the preceding operations.

Then followed various operations on the stomach to which I will allude later, and finally the successful removal of the entire stomach. It is quite impossible to give the details of all the various operations now done on the stomach and indicate minutely the part that vivisection has had in developing this extraordinarily successful branch of modern surgery. Suffice it to say that among them are the following, all of which owe more to vivisection experiments than to any other single agency:

In cancer of the œsophagus or in the constriction of the œsophagus, which so often follows the accidental or intentional swallowing of lye or acids, etc., so that no food can get into the stomach, we now open the abdomen, open the stomach, introduce a tube or construct a passageway into the stomach, and feed the patient through this outside œsophagus, as it were. In case the narrowing of the œsophagus is not from cancer the patient can live his natural span of life. In case of cancer his remaining days are rendered relatively comfortable, since the operation prevents his starving to death. When we have cancer at the opposite end of the stomach (the pylorus), so that the food, though it can be swallowed, cannot get out of the stomach, one of two courses is followed, both of which have been carefully studied in the lower animals and then adapted to man. First, the portion of the stomach and bowel involved in the cancer is cut out and the bowel united to the stomach directly, or, in other cases, an opening is made in the stomach and one in the bowel lower down, and the two openings are sewed together, thus allowing the food to pass from the stomach directly into the bowel beyond the cancer. The mere question of how the stomach and bowel shall be most successfully united in these cases, particularly the best method to prevent fatal leakage, has required very many series of experiments, especially in this country, by Senn, Abbe, Brockaw, Ashton, Murphy and others. As a result of their labors sometimes we have learned how not to do the operation because of unexpected difficulties; sometimes how to better our procedure, until now we are in possession of satisfactory methods, as has been proved by the successful operation on man many times over. Even the sewing together of the stomach and bowel alone had been done up to 1898 in 550 cases which have been published. I have no doubt that since then this number has almost been doubled. The mortality of this operation from 1881 to 1885 was 65.71 per cent.; from 1886–1890, the mortality had fallen to 46.47 per cent.; from 1891 it had again fallen to 33.91 per cent., and recently in 27 cases an Italian surgeon (Carle) has had a mortality of only 7.4 per cent.

Moreover, the experiments on animals having shown how safe various operations are, have emboldened us to enlarge the sphere of our operations and do others that were before not dreamed of — a good instance of the partly indirect good results from vivisection. A brief enumeration of some of the various operations done upon the stomach, together with their mortality, is as follows:

(1) Where the stomach is bound down by adhesions (which often produce the most serious digestive disturbances, destroying comfort and even threatening life), we now open the abdomen, cut or tear the adhesions, and practically all of the patients recover.

(2) Where there are foreign bodies in the stomach (or in some cases foreign bodies that have stuck in the œsophagus low down, near the stomach), we open the stomach, remove the foreign body (often inserting the entire arm to reach it in the œsophagus), sew up the stomach and the abdominal

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wall, and the patients generally recover. In some cases as many as 192 staples, buttons, screws, horseshoe nails, etc., weighing over a pound and a half, have been removed, and the patients have recovered.

(3) Where the œsophagus has been narrowed by the swallowing of lye, etc., instead of making a permanent opening in the stomach (as before described), sometimes by having the patient swallow a perforated shot which will carry a string down into the stomach, we can open the stomach temporarily, seize and draw out the shot, attach a conical dilator to the string, and, after having dilated the constriction of the œsophagus, remove the string, sew up the stomach and the abdominal wall and cure the patient permanently.

(4) We now open the stomach purely to explore it and find out whether or not there is serious disease. This has enabled us in many cases to relieve illness which otherwise was incurable. Nearly all of these patients recover from the operation.

(5) The permanent opening in the stomach through which we can feed a patient I have already described. It was first proposed in 1837. It was first done in 1849. From then until 1875 28 cases were operated on, with 28 deaths! It seemed almost as though the operation must be abandoned when, in 1875, the first operative recovery occurred. From then until 1884 in 163 cases there were 133 deaths — a mortality of 81.66 per cent. At the present time the mortality is only about 25 per cent. in cases of cancer, and in the non-malignant cases not over 10 per cent.

(6) As I have indicated, in certain conditions we make an opening in the stomach and another in the bowel and sew the two together. In some cases of ulcer of the stomach, which cannot be cured by medical means, this gives wonderful results, both as to comfort and cure. The operation was first done in 1881, with a mortality decreasing from 65.71 to 33.91 per cent. in general, and in the statistics of single surgeons to only 7.4 per cent.

(7) The first removal of the pylorus with the union of the bowel and stomach was done in 1879. The mortality was very great, and still is large, ranging from 27.2 per cent. in simple cases to 72.7 per cent. when there are extensive adhesions.

(8) When the pylorus is simply narrowed, but is not the seat of cancer, we make an incision in its long axis, seize the edges of the incision at the middle, draw them out at right angles to the line of the incision, and by sewing them in this position we widen the opening of the pylorus. This was first done in 1886. Up to 1894 the mortality was 20.7 per cent. Recently Carle has reported 14 cases, with a mortality of only 7 per cent.

(9) In not a few disorders the stomach is dilated to nearly two or three times its normal size. In these cases we now take a "tuck" in it, as was first done in 1891. Up to three years ago 15 such operations had been done, with only one death.

(10) When the stomach, instead of being dilated, is displaced, we sew it fast, and practically in all cases recovery follows.

(11) Sometimes the stomach is divided into two parts, like a dumb-bell with a very short handle. The first operation for relieving this condition was done in 1893 by making an opening in each half of the stomach and sewing the two openings together. Up to this time over 40 operations have been done for this condition, with only nine deaths.

(12) Tumors of the stomach other than cancer are rare, but since 1887 at least seven cases of tumor have been cut out, of which six have recovered.

(13) Partial removal of the stomach, finally led to its complete removal, of which over a dozen instances have been reported, with a recovery of somewhat more than half. Nearly all, however, have died from recurrence.

Some of the above operations are not the direct result of experiment upon animals (as, for instance the taking of a tuck in the stomach); but they are the indirect result, first, through the antiseptic method, which itself is the child of vivisection, and, secondly, because through our experience in other operations we have been led to perform totally new ones. It is the same in other sciences. If we were still dependent upon the old "air pump" worked by hand we should have no lighting by the incandescent bulb of today, for this is dependent upon a cheap method of making an almost complete vacuum. This is a wholly unexpected and indirect result of improvement in air pumps as one of the chief factors of progress.

*The Intestines.*— Very much the same story can be told of the surgery of the bowel. Indeed, the surgery of the stomach involves largely that of the bowel. I need, therefore, only recall a very few points. When a tumor or cancer exists in the bowel, of course, in a little while it obstructs the passage of the intestinal contents; and if this obstruction becomes complete and is not quickly removed the patient must necessarily die. As a result of many experiments upon animals (more especialy by Senn, Parkes and other American surgeons) we now know how to deal with this condition. First, if the tumor or cancer can be removed it is cut out entirely, and the two ends of the bowel are united. Our present successful means of uniting them are a result of most laborious researches by experimentation upon animals to discover the best method of doing this otherwise perilous operation. The slightest leakage of intestinal contents produces a fa-

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tal peritonitis. Where the cancer cannot be removed, in order to prolong the patient's life and lessen his terrible pains we make an opening above the obstruction and another one below and sew the two openings together. Here again many experiments were needed to determine whether an animal could live with the intestinal contents thus "side-tracked," and if life could be maintained, what was the best method of doing the operation.

In gunshot wounds of the intestines, which formerly were among the most fatal of all accidents, we now can rescue a very large percentage of the patients. During the Civil War practically almost every case of perforation of the intestine by gunshot died. To see whether something could not be done to remedy this frightful mortality Gross many years ago performed some experiments to determine the best treatment of such wounds. Later Parkes etherized a number of dogs, shot them, opened the abdomen and treated the wounds in various ways; and in consequence of this and other series of experiments, at the present time many instances of recovery have been reported in which multiple wounds even to the number of 17 have been found closed by methods determined by vivisection to be the best, and the patients have recovered. To reach this result it had to be determined by accurate observation on animals what was the best method of closing such wounds; what material is the best for use as a thread; under what conditions it would be needful, instead of closing the wound, to cut out the injured portion of the bowel and unite the two ends; how long after perforation occurred was the best time to operate, and many other such questions too technical to mention here.

In typhoid fever and in ulcer of the stomach also sometimes a perforation similar to the hole made by a bullet occurs, and the contents of the intestines or of the stomach are poured out into the abdominal cavity. Of course, every one knows that if this went on for a brief time death would necessarily follow. In the lower animals we cannot produce exactly the conditions following gastric ulcer and typhoid fever; but, in consequence of the knowledge acquired by experimenting upon gunshot and incised wounds of the stomach and bowel in the lower animals, in 1884, we finally woke up to the fact that a perforation after such an ulcer, either in the stomach or in the bowel from typhoid fever, ought to be closed. In 156 cases of such perforation of the stomach operation has been done, and the recoveries have been 46.80 per cent. But in the last 54 of these operations done from 1896 to 1898 the percentage of recoveries has risen to 64.82 per cent. In 158 such operations done for perforation of the bowel in typhoid fever collected in 1898 the recovery rate was 23.41 per cent. Since then it has risen to over one in three, and ultimately, I believe, one-half of such patients will be saved. It must be remembered that in such perforations of the stomach and bowel every patient would die were no operation done. To save one-half or even one-third is a surgical triumph.

I have several times alluded to cutting out a portion of the bowel and uniting the two ends. This involves a number of problems which ought not, and, in fact, cannot, be studied in man because of the fact that it is wholly inadmissible to test such operations (which always involve life) on man when they can be tested accurately and more quickly by experiments on animals and without involving human life.

I have stated that by many experiments on animals we have now reached a satisfactory solution of the problem how the two ends of the bowel are best sewed together. But one other question was still unanswered — how much of the bowel could be removed and yet life be preserved. A similar question, we have seen, has been answered in respect to how much of the liver could be removed by Ponfick's experiments. How much of the bowel could be removed was a most important question. We would all presume that a few inches, possibly even a foot or two, might be removed without danger; but when we remove a larger portion we cut down the digesting and absorbing surface to such an extent that it is a question whether the patient can still live. This has been determined upon animals, and then, as occasion required us to decide the question, in man. As a result of the knowledge derived from animal experimentation I saw four years ago in Montreal a man from whom Shepherd had removed over one-third of the entire length of the bowel (eight feet) which was involved in a large tumor; and yet the patient was in capital health a long time after the operation.

*Hydrophobia.* — The search for the germ of this dreadful disease has as yet been fruitless; but happily the search for the means of prevention has been crowned with success. Of every 100 persons bitten about 15 contract hydrophobia, and of those bitten on the head and face at least 80 per cent. die of hydrophobia. The Pasteur treatment, which is entirely the result of animal experimentation, by preventing its occurrence, has reduced the mortality to less than 1 per cent.; and yet the establishment of Pasteur Institutes for the benefit of the human race has been resisted most strenuously by those opposed to vivisection.

*Transplantation of Bone.* — In 1867 Ollier, a celebrated French surgeon who recently died, by experiments on animals showed that the membrane which covers the bones (the periosteum) could be peeled off a bone

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and transplanted to a distance into the tissues of the same animal, or even of another animal, and that it would there live and produce new bone. These experiments, very crudely described in these few words, have been extraordinarily fruitful in several directions.

First, in certain cases it is necessary to remove diseased or dead bone. These experiments showed us that if in removing the bone the periosteum was carefully guarded and left behind it would reproduce the bone. In some cases in which the lower jawbone has died as a result of phosphorus poison in the employes of phosphorus match factories, the dead bone has been removed, but the periosteum has been preserved and a new jawbone has been reproduced. Another result has been that, instead of amputating, for example, an arm when the elbow is diseased, we can remove the bone and by preserving the periosteum can preserve a more or less useful joint.

In other cases a certain area of bone, as, for instance, in the skull, is chiseled loose or otherwise separated from the surrounding bone excepting for an inch or two at the portion where the chief blood supply enters the flap. The bone is then forcibly broken at this unchiseled portion and turned back, the periosteum and scalp acting as a hinge. When the tumor has been removed, the abscess opened, or other needful operation done, the trap door is simply closed by replacing the flap, the scalp sewed in place and the integrity of the skull is restored. One can see that this is an immense advantage over having a great hole left in the side of one's skull.

In some cases, in which, in consequence of accident or abscess, a large hole already exists in the skull, we either chisel off bits of adjacent bone or take pieces of bone from one of the lower animals and successfully fill this opening.

Again, in certain cases, for example, in which the jaw has been fractured, a bit of the bone has been chiseled loose from the patient's jaw and has been grafted in place as a bridge between the two fragments, so relieving the deformity or remedying an otherwise incurable fracture.

Again, a certain small number of children are born without any bone at the back of the spine in the neck or the loin (spina bifida). Through this opening the membranes of the spinal cord protrude and form a tumor which, if untreated, in most cases proves fatal. We now operate most successfully on many of these cases, and in suitable cases either chisel loose a bit of adjacent bone and transplant it, so as to close the opening, or in other cases take a bit of bone from one of the lower animals to fill the opening and cure the patient.

Again, in certain cases of fracture of the arm bone (humerus) the nerve going to the muscles on the back of the forearm, which winds close around the bone in a spiral, is torn in two; these muscles are paralyzed, and the patient has what we term "wrist drop," so that the hand is useless. In such cases the knowledge derived from two different series of experiments comes to our aid to enable us to remedy the trouble. First we find the two ends of the broken nerve, freshen these ends, unite them, and in many cases can change a useless hand into a useful one; but if so much of the nerve has been destroyed that the two ends cannot be brought together we now deliberately remove an inch or two of the arm bone, thus shortening the arm so as to bring the two ends of the nerve together, and in a good percentage of cases we can again restore the hand to usefulness after months and occasionally even after years.

A still more remarkable transplantation of the bone is accomplished in some operations on the skull. In some cases it is necessary to remove a button of bone which may be an inch and a half or two inches in diameter in order to do an operation on the brain. The operation which has necessitated this removal of bone may require an hour and a half or two hours. If we want to replace the bone so as not to leave an opening in the skull through which the brain may easily be dangerously injured we put it in a basin of hot salt solution or weak antiseptic solution, and by keeping it at a proper temperature, at the end of the operation, when it has been totally detached from the body for so long a time, we replace it and its vitality is not lost.

All of these various operations (and others which I have not time to describe) done on bone, to the immense advantage of our patients, are the direct or remote results of the experiments of Ollier and others on the transplantation of periosteum and of bone. The indirect results are quite as valuable, and sometimes more valuable, than the direct results of such experiments.

An illustration of the indirect results of Ollier's experiments is shown in the transplantation of the skin. One of the oldest operations in surgery is the making of a new nose. When the nose has been lost a suitably shaped flap was cut on the forehead, leaving a sufficient uncut base for a proper blood supply so that the flap would not undergo gangrene. The flap was then turned by twisting it on its base and was sewed in place where the nose had been. The experiments of Ollier and his successors showed, however, that periosteum, and even so dense a structure as bone, could be entirely detached from the body for a long time and yet not lose its vitality. Hence we now transplant bone as well as skin to make firm instead of flabby noses. This has led us of late years to apply the same procedure to the skin, and enables us now to

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do far more extensive and more successful operations than would otherwise have been possible. The first method tried in man was that of Reverdin, of Geneva. He cut little bits of skin only as big as a pin's head from the arm or the thigh, not quite skin deep, and planted them on any raw surface which did not heal readily. These grafts under proper treatment adhere and form new centers from which healing of the wound takes place. Emboldened by this, Krause and other surgeons have taken very large pieces of skin, including often the whole thickness of the skin, and transplanted them. For example, in some cases of extensive cancer in which a very large portion of skin must be removed, now, while the patient is under the influence of the anesthetic, we take strips of skin an inch wide and several inches long from the thigh, or, in other cases, from another person who is willing to give up a portion of his skin. These pieces are immediately placed on the raw place left by the removal of the tumor, and as they do not lose their vitality but grow fast to the tissues under them, the wound is healed almost immediately, instead of taking a long time for the slow formation of a scar.

One of the most difficult of all wounds to heal is an extensive burn, such as is produced by the clothing catching fire. In these cases large surfaces of the skin on the chest or the abdomen slough off, resulting in great ulcers. These sometimes take months, sometimes years, to heal, and in not a few cases never heal, no matter what is done. Now, as a result of our experience, first with the periosteum and bone and then with small bits and then larger bits of skin, we transplant strips of skin as just described, and heal such wounds in a very short time. One sees in the newspapers every now and then accounts of some woman whose long hair has been caught in machinery and almost all of the scalp torn away. These wounds are healed by transplanting skin in a similar manner.

*The Blood.* — We are at present only just beginning to appreciate how much we can learn from examination of the blood, especially by new methods lately introduced. Almost every intelligent person knows that the blood consists, roughly speaking, of a fluid in which float small circular disks, about $\frac{1}{3000}$ part of an inch in diameter, called the red blood cells. In addition to these there is in the blood another kind of cell called the white blood cell. The red blood cells are made up chiefly of a substance called hemoglobin, which gives the color to the blood. Some of the investigations, which are really only at present at the beginning of their usefulness, are as follows. They are good illustrations of how inductive science begins by ascertaining facts. If they are valueless they are disregarded; if of value they are studied still further. It is not unlikely that the blood may soon be one of the most fruitful sources of the knowledge by which surgery may profit greatly:

First, the number of white blood cells. It is found that in case inflammation results in an abscess the number of white blood cells is increased several times. Ordinarily in a little cube of blood one millimeter (the twenty-fifth part of an inch) on each of its sides the number of red blood cells is about 4,000,000 to 5,000,000, and the number of white blood cells is 8,000 to 10,000.

If one has an abscess the white blood cells as a rule will rise to 15,000, 20,000, 25,000 or more to the cubic millimeter — a condition that we know scientifically as "leucocytosis." In certain cases when it is a question whether an abscess exists (as, for instance, in the brain, in the liver, and other parts of the body in which the diagnosis is very difficult to make) if the leucocytosis or its absence will show us absolutely that there is or is not an abscess present it would be of the greatest help.

Again, in typhoid fever the pain and tenderness exist just above the right groin. In appendicitis the pain and tenderness exist in the same region, and in not a few cases it is extremely difficult to distinguish between these two diseases. Especially is this true at the beginning of such an illness, just when it is most important to make the right diagnosis and institute the correct treatment. If the presence of leucocytosis will show us distinctly that it is appendicitis, and the absence of of leucocytosis that it is typhoid fever, an immense gain in accuracy of diagnosis, and, therefore, of the proper treatment, will result. To open the abdomen, if it is typhoid fever (without perforation), would be a dreadful mistake; not to open it, if it is appendicitis, would be, as a rule, equally wrong treatment. If the leucocytosis is a sure guide we cannot learn it too quickly. It seems to me very reasonable, therefore, that experiments should be made in the lower animals by producing abscesses and determining whether under many varying conditions leucocytosis is always present when there is an abscess and always absent when there is no abscess.

Second, the hemoglobin, which makes up the bulk of the red blood cells, is the means by which oxygen is carried to all parts of the tissues. Whenever an anesthetic, such as ether or chloroform, is given, the amount of hemoglobin is distinctly diminished, and by this means the oxygenation of the blood is hindered. In certain conditions of the system the percentage of hemoglobin is diminished to 60, 50 or even as low as 25 of the normal. If an anesthetic is given to a person with an already diminished percentage of hemoglobin this percentage is still

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further diminished, and the oxygenation of the blood still further hindered. If, then, the percentage of hemoglobin is very small before an operation the danger of giving an anesthetic is very marked; if the hemoglobin is as low as 30 per cent. it is very likely that the patient may die upon the table irrespective of the operation, simply because the anesthetic reduces the hemoglobin to such a point that the blood does not absorb enough oxygen to carry on life. Some authorities have stated that we ought never to give ether or chloroform to a patient whose hemoglobin is below 50 per cent. Others have placed the limit as low as 30 per cent. Surely this subject which is very recent and about which we know up to this time very little, ought to be investigated with the greatest care in animals rather than to decide the question by sacrificing life by venturing to give an anesthetic to patients whose hemoglobin is at so low a point as to be inconsistent with safety.

Other recent researches are those on the temperature at which the blood freezes and the lapse of time after the blood is drawn from the body before it coagulates — that is, clots. A small portion of blood drawn by a prick of the finger enables us to determine these four conditions — *i. e.*, (1) the presence or absence and degree of leucocytosis: (2) the percentage of hemoglobin; (3) the freezing temperature of the blood, and (4) the coagulation time of the blood. We are beginning to see that these last two as well as the first two will probably prove of the greatest value in reference to surgical operations. Hence we ought to learn accurately and quickly all the facts in the case by experiments upon animals, and so avoid dangers to human life of which until lately we have been quite ignorant.

These would include experiments upon animals fasting, or after feeding; after being bled; after surgical operations have been done upon them; after an anesthetic is given to them; when the anesthetic is administered for a short time, for a longer time, for a very long time, for a time long enough to kill them, in order to determine what the effect of the anesthetic is in fatal and non-fatal doses. It is of the utmost importance that we should know exactly and speedily the result of all these conditions. If we are debarred from learning them by experiment on animals, then the human race must go without the knowledge we seek, saving as it is revealed to us from time to time by studying slowly and inexactly the results in man. With certain modifications due to the slight differences between man and animals the conclusions drawn from experiments on animals apply to man.

Let me give one instance which confronts the surgeon not infrequently. An abdominal section is occasionally followed by very great and, it may be, dangerous and alarming depression. One of the most difficult things to determine in some cases is whether this condition is due to the shock of the operation or to internal hemorrhage. This hemorrhage differs from that which may follow an amputation or removal of a tumor from the neck, etc., by the fact that it is concealed within the abdomen, and its existence can only be inferred. If the patient is suffering from shock, stimulation, heat, quiet, certain drugs, etc., will be resorted to to enable him to recover. If it is due to internal hemorrhage, we must instantly reopen the abdomen and tie the bleeding vessel. To do the latter operation when the patient is only suffering from shock might prove fatal; not to do it, if hemorrhage is the cause of the depression, is certainly fatal. No one not a surgeon can appreciate the anxiety, the careful weighing of evidence, the intense longing for some positive means by which a correct diagnosis may always and surely be made, which every surgeon feels in such an emergency.

It is possible that by examining into the presence or absence of leucocytosis, by determining the percentage of the hemoglobin, or possibly even the coagulation time and the freezing temperature of the blood in a number of operations in human beings, we might be able positively to determine the difference between shock and internal hemorrhage, but only after making many blunders, each of which would cost a human life. In an animal we can open a blood-vessel in the abdomen and let it bleed for a longer or shorter time, and determine positively the leucocytosis, the hemoglobin, etc., the animal meantime suffering nothing because it would be under an anesthetic. Which is the right, which the kindest, which the most humane way of finding out the truth? This is an illustration of the harmlessness to animals of such experiments and their priceless value to human beings.

*Experiments to Enable us to make a Reliable and Speedy Diagnosis.*— In some cases in which the diagnosis is difficult, or may require considerable time, experiment upon animals aids us greatly, and so is of immense value to man. Thus in supposed anthrax, or wool-sorter's disease, a most dangerous malady, by inoculating a guinea pig with the discharge the diagnosis can be cleared up quickly and proper treatment instituted. If a case suspected to be one of bubonic plague arises the diagnosis can be established within 24 or 36 hours by a similar injection into a rat or a guinea pig, the apprehensions of a community (to say nothing of the patient and his friends) relieved and the greatest damage to its commerce averted by discovering that it is not the dreaded pestilence, or, if it is the plague, by showing the necessity for most stringent measures of prevention. I do not think any community will or ought to allow sympathy

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with the unavoidable suffering of a few rats or guinea pigs to weigh in the balance against the safety of many human lives or the ruin of large business interests.

An amusing instance of how sentiment gives way before affection and facts occurred not long since in England. The brother of the Duke of Newcastle was bitten by a dog supposed to be rabid. The duke was a vice-president of the Anti-Vivisection Society, but knowing that whether the dog was rabid or not (and, therefore, whether his brother was in danger or not) could only be settled by inoculation experiments upon animals, he took the dog to Mr. Horsley, in London, and had the experiment done.

By similar means anthrax and actinomycosis (or lumpy jaw, which spreads to man as well as to herds) among cattle are diagnosticated and eradicated; glanders in horses is recognized and stamped out and tuberculosis in cows is eradicated, not only preventing its spread to healthy cattle, but through the milk to many human beings, especially young children, whose chief diet must be milk.

By similar experiments on animals chicken cholera, hog cholera, Texas fever and many other diseases of cattle, sheep, horses, hogs, poultry and other animals have had their causes discovered and the means of prevention or of cure demonstrated. The reports of the Bureau of Animal Industry at Washington enter into these in detail. Surely the poor animals which have benefited so greatly from such experiments should pray to be saved from their friends if these beneficent researches are to be prohibited.

I often wonder what would have been the influence on surgery if the young man who first took ether in the Massachusetts General Hospital on Oct. 16, 1846, had died. Morton, it is true, had experimented on some dogs first, but, as we now view it, very inadequately. Had this patient died, would not the use of ether have been deferred for years, possibly even till now, and meantime the human race all over the world have gone on suffering the horrible tortures of the pre-anesthetic days and all our modern progress in surgery have been prevented?

If the sacrifice of the lives of even a considerable number of animals enables us to reach the benevolent purposes a few of which I have described, is it not plainly a moral duty to perform them so as to obtain this knowledge? Is it not wrong to hinder such benevolent researches? Especially is it not wrong so to hinder research when, in the vast majority of instances, animals suffer little or nothing? In almost all experiments not only can an anesthetic be used, but in all involving difficult and delicate operations it is essential to do so; for it is impossible to do such an operation on an animal struggling from pain. Not only, therefore, does sentiment lead the vivisectionist to spare the animal all the suffering that is possible, but scientific accuracy points in the same direction. A very few experiments, principally those on the nervous system which require us to determine the presence or absence of sensation, cannot be done with an anesthetic; but these experiments are few and far between. Some experiments also (for instance, those on lockjaw, to which I have already alluded) by producing the disease, necessarily make the animal suffer; but if by the suffering of a few animals, human beings suffering from lockjaw can be cured, or, still better, if we can learn the cause of the disease and so can prevent it from attacking human beings, is it not worth the suffering? The infliction of suffering is not cruelty. If one dear to us meets with an accident far away from surgical aid and we spur a horse to the utmost, so that finally it drops dead in the frantic effort to bring surgical assistance, I am sure no one would accuse us of cruelty, although we had inflicted torture upon the horse. So this infliction of pain on a small percentage of animals experimented on is not cruelty, but is the greatest kindness to other animals and to a much higher animal — man himself.

I have been able in this paper only to select a few illustrations of the progress that surgery has made by experimentation on animals. Practically, as I said at the beginning, nearly all of these have occurred during my professional life, and I speak, therefore, of what I know. Although I myself am not a vivisectionist, yet I could not do the work I do every day and accomplish results I do were it not for just such work, of which I take advantage. In view of these facts, therefore, how unwise it would be to restrict and still more to abolish such life-giving and pain-saving results of vivisection, especially when the animals themselves benefit from these experiments fully as much as man. I have not referred to any of the older experiments, such as those remarkable experiments of Jones on the methods of tying blood-vessels in the early part of the last century, nor of Sir Charles Bell's experiments by which he determined the functions of the two different roots of the nerves just as they emerge from the spinal cord, nor of the circulation of the blood as discovered by Harvey. All these are fundamental; and without the knowledge derived from them we should be a century or more behind where we are now. I have preferred rather to take modern instances with which I am personally familiar in order to illustrate the subject which I have been asked to describe. I cannot believe that any unprejudiced, fair-minded reader will not agree with me that such humane purposes should be fostered and not hindered; should be encouraged and not abolished.

W. W. Keen, M. D.

**Vizetelly, Henry Richard,** an English publisher; born in London, June 30, 1820. He was the first publisher to introduce to English readers "Uncle Tom's Cabin," and the works of Poe, Tolstoi, and Zola, being prosecuted and imprisoned for bringing out the novels of the French realist. In 1843 he founded the "Pictorial Times," one of the pioneer journals of the British pictorial press. He acted as Paris correspondent of the "Illustrated London News" (1866–1876), and represented the government at foreign expositions. His earliest work, "The Story of the Diamond Necklace" (1867), a sketch of the Countess de la Motte, was followed by a translation of Topin's "Man with the Iron Mask" (1879); "Berlin Under the New Empire" (1879); "Paris in Peril" (1882), a vivid account of the siege of 1870–1871; "A History of Champagne," a monograph on wines; "Glances Back Through Seventy Years" (1893). He died in Tilford, near Farnham, England, Jan. 1, 1894.

**Vizeu,** a town of Portugal, province of Beira; 50 miles N. N. E. of Coimbra. It is old, irregularly built on a hill, and contains a cathedral with fine paintings, also a college, hospital, and theater. There are two large squares, in one of which a great market is held in September. Among many Roman and Moorish remains is a Roman camp, the Cava de Viriatho, where Junius Brutus was defeated by Viriathus. Pop. (1900) 8,216.

**Vizianágram,** a town in the district of Vizagapatam, Madras presidency, British India; 35 miles N. of Vizagapatam, and 12 miles from the seacoast. In the fort is the palace of the Rajah of Vizianagram, a Rajput family which figures largely in the early history of the British in Madras. Pop. (1901) 37,270.

**Vizier,** the title of a high political officer in the Turkish empire and other Mohammedan states. The title is given in Turkey to the heads of the various ministerial departments into which the divan or ministerial council is divided, and to all pashas of three tails. The prime minister, or president of the divan, is styled the grand vizier, vizier-azam, or sadr-azam. In India vizier was the title of the highest officer at the Mogul court at Delhi; and nawab-vizier ultimately became the hereditary title in the dynasty ruling at Oude.

**Vizzini,** a town in Sicily, province of Catania, 28 miles S. S. W. of the city of Catania; has handsome streets and several fine buildings, including a college, hospital, and library.

**Vlaardingen,** a town of the Netherlands, province of South Holland; on the New Maas; 8 miles W. of Rotterdam. It has one Catholic and one Protestant church, the latter with fine sepulchral monuments. Vlaardingen is the chief center of the Dutch herring fishery, and has large docks, shipbuilding, and considerable trade. Pop. (1900) 16,662.

**Vlachos, Angelos** (vlak'os), a Greek statesman; born in Athens in 1838. Among his writings are: "The Homeric Question" (1866); "New Greek Chrestomathy" (1870); "Comedies" (1870); "Modern Greek-French Dictionary" (1871); "Lyric Poems" (1875).

**Vladikavkaz,** capital of the Russian province of Terek, in Northern Caucasia, at the foot of the main Caucasus chain, and at the opening of the valley of the Terek. It is the terminus in this direction of the Russian railway system, and is on the only carriage road through the Dariel Pass to Tiflis and the S. of the mountains. There is a fortress here, and considerable trade. The inhabitants are Cossacks, Armenians, and a motley representation of various Asiatic races. Pop. (1897) 43,843.

**Vladimir,** a province of Russia, surrounded by Jaroslav, Kostroma, Nijni Novgorod, Riazan, Moscow, and Tver; area, 18,862 square miles. The surface consists of level and undulating plains, and the soil is fertile. About 32 per cent. is covered with pine forests. The whole province is drained by the system of the Oka, which flows for 82 miles through Vladimir, and receives from the left the Kliasma, with its navigable tributary, the Tesa. The largest lake is Plechejevo, which receives the Trubesh, and sends the Great Nerl to the Volga. The principal crops raised are buckwheat, rye, oats, potatoes, pulse, flax, cherries, and onions. In industrial activity Vladimir ranks next to Moscow and St. Petersburg. Its manufactures include paper, crystal, glass, chemicals, brandy, cotton, linen, and woolen fabrics, and metal wares, chiefly knives, chisels, locks, gimlets, and reaping hooks. The forests yield timber, pitch, and tar. A special industry of Vladimir is the manufacture of icons, to the value of 1,200,000 rubles, annually. Pop. (1909) 1,845,500.

VLADIMIR, the capital of the province, on the Kliasma, 110 miles E. N. E. of Moscow by rail, has 28 churches, two monasteries, handsome government buildings, etc., and manufactures of icons. Pop. (1900) 32,029.

**Vladimir I.,** a Czar of Russia, commonly called VLADIMIR THE GREAT, or SAINT VLADIMIR; son of the Grand-Duke Sviatoplav by a woman of low condition, and great grandson of Rurik. His father assigned to him the government of Novgorod, dividing the rest of the empire between his two legitimate sons, Jaropalk and Oleg. In 977

Jaropalk quarrelled with Oleg and killed him, and Vladimir would probably have met the same fate had he not fled to the Varangians. Two years later he returned with an army, overcame Jaropalk, and remained sole master of the empire, having his capital at Kiev. He then set himself both to extend and to consolidate his dominions, which were little better than a collection of tributary states, scarcely subject to any real control. He enlarged his boundaries from the Black Sea to the Baltic, and appears to have had an intention of welding his empire into a homogeneous mass through the agency of a common religion, in which he tried to combine the Slavonian and the Finnish superstitions. In 988, however, an event occurred which altered his schemes entirely. He had already five wives and almost 1,000 concubines, but while besieging the Christian city of Cherson, in the Crimea, he conceived the idea of demanding the hand of Anna, the sister of the Byzantine Emperors Constantine and Basilios. Through the agency of this princess, known in history as Anna Romanovna, he was converted to Christianity. His subjects, who had already been prepared for Christianity by intercourse with the Greeks, followed his example. The Scriptures had already been translated into Slavonic by Cyrillus and Methodius, and Russia soon became a Christian country. Vladimir was then as enthusiastic in his Christian virtues as he had formerly been in his heathen vices. He could scarcely be induced to sanction capital punishment, he exercised a lavish charity, built churches and monasteries, and promoted not only the Christianization but also the civilization of his subjects. He died in Beresyx in 1015 at a great age, and divided his empire among his 12 sons. The Russian Church canonized him, and gave him a rank equal to that of the Apostles, and the famous "Vladimir order" was founded in his honor by the Empress Catherine II. in 1782.

**Vladimir II.,** called MONOMACHUS, after his maternal grandfather, the Emperor Constantine Monomachus, was born in 1052, and succeeded to the empire in 1113, in opposition to the ordinary Slavonic rules of inheritance. Though not free from some of the barbarisms of his age, he did much for Russia by the establishment and enforcement of just laws, and the consolidation of the internal affairs of the empire. He was married to Gida, daughter of King Harold of England, and his granddaughters married the kings of Norway and Denmark, so that the famous Valdemar of Denmark, probably so named in his honor, was his great-grandson. He died in Kiev, May 19, 1125, leaving behind him a long "testament" full of instructions to his descendants, which presents a curious picture of contemporary manners and opinions.

**Vladivostok,** a seaport of Eastern Siberia; on the harbor of the Golden Horn in the Gulf of Peter the Great, Japan Sea. It was founded in 1861, and is an important naval station of Russia, and the E. terminus of the Trans-Siberian railway, the first sod of which was cut at Vladivostok, May 24, 1891, the line being opened in December, 1901. The harbor is surrounded by hills which are well fortified. In 1901, two large dry docks were in course of construction, waterworks, electric street railways, and street lighting plants were begun, and the Russian government was planning two large metallic shipbuilding yards, and 60 new mechanical shops. Vladivostok is an open port, and has lines of steamers running to Japanese and Korean ports and a line opened in 1900 to Seattle, Wash. Ice-breaking steamers keep the harbor open in the winter months. Pop. (1901) over 30,000. See TRANS-SIBERIAN RAILWAY.

**Vlad Kashirin.** See MACGAHAN, BARBARA.

**Vltava.** See MOLDAU.

**V Moth,** the *Halia wavaria,* a rather common European geometer moth, family *Macaridæ.* Antennæ of the male pectinated, those of the female simple. Wings gray, tinged with a faint iridescence or purple gloss; the fore wings streaked, and having four conspicuous spots, the second one shaped like a V, whence the name. The caterpillar feeds on the gooseberry.

**Vocal Chord,** in anatomy, one of the inferior thyro-arytenoid ligaments or elastic membranes, the edges of which form the side of the glottis. The vocal chords are attached in front to the thyroid cartilage, and end behind in a process of the arytenoid cartilages. They nearly close the aperture of the windpipe. In addition to them there are upper or false vocal chords, which are not immediately concerned in the production of the voice.

**Vochyaceæ,** or **Vochysiaceæ,** in botany, vochyads; an order of hypogynous exogens, alliance Sapindales; trees or shrubs with opposite branches, four-angled when young. Leaves normally opposite, the upper ones sometimes alternate, with glands or two stipules at their base; flowers generally in terminal panicles or large gayly-colored racemes; sepals four to five, unequal in size, the upper one the largest and having a spur; petals one, two, three, or five, unequal; stamens one to five, generally opposite to the petals, most of them sterile, but one having a four-celled fertile anther; style one; stigma one; ovary three-celled, each with one, two, or many ovules; capsule three-angled, three-celled, three-valved,

or occasionally one-celled, one-seeded; seed usually winged. Natives of tropical America.

**Vochysia,** or **Vochya,** the typical genus of *Vochyaceæ;* tropical American trees with ovate entire leaves, opposite or verticillate. Flowers in panicles, yellow or orange, with a smell of violets; calyx five-cleft, one segment spurred; petals three, one larger than the others; stamens three; capsule triangular, with three cells, each containing a one-winged seed.

**Vodhena.** See EDESSA.

**Vodka,** an intoxicating spirit distilled from rye, and much used in Russia.

**Vœlknerite,** a talc-like mineral, occurring massive and foliated with yellow serpentine, at Snarum, Norway, and at Slatoust, Urals; crystallization, hexagonal; hardness, 2.0; sp. gr., 2.04; color, white, luster, pearly; feel, greasy; translucent to transparent. Composition: Alumina, 16.8; magnesia, 39.2; water, 44.0 = 100, yielding the formula $Al_2O_3,3HO + 6MgOHO + 6HO$.

**Vogdes, Israel,** an American military officer; born in Williston, Pa., Aug. 4, 1816; was graduated at the United States Military Academy in 1837; promoted 1st lieutenant in 1838; and captain in 1847; served in Florida against the Seminole Indians in 1849–1856; was captured by the Confederates, Oct. 9, 1861, while repelling their attack on Santa Rosa Island, Fla.; released in August, 1862; commissioned Brigadier-General of volunteers in November following; and commanded Folly Island, S. C., in April–July, 1863; participated in the operations against Fort Sumter in 1863–1864; promoted colonel, U. S. A., Aug. 1, 1864; commanded the defenses at Portsmouth and Norfolk in 1864–1865; brevetted Brigadier-General, U. S. A., in April of the latter year; and was retired at his own request in January, 1881. He died in New York, Dec. 7, 1889.

**Vogel, Eduard,** a German African traveler; born in Crefeld, Prussia, March 7, 1820; son of Johann Karl Christoph Vogel, afterward director of the public school at Leipsic. Devoting himself to astronomy, he studied at Leipsic and Berlin, and in 1851 became assistant to Hind in London; but in 1853 he was called to take command of an expedition from England intended to coöperate with Barth and Overweg in Central Africa. In January, 1854, he reached Lake Tchad, in December joined Barth near Zinder, and in 1855 pushed S. to Yacoba and the Benue. Before the close of the year he entered the kingdom of Wadai, where in the early part of 1856, probably on Feb. 8, he was murdered near Abeshr.

**Vogel, Hermann Wilhelm** (fō′gel), a German photographer and spectrum-analyst; born in Dobrilugk, Prussia, March 26, 1834. He conducted, for many years, researches and experiments in color photography, and wrote: "From the New Witches' Caldron: Sketches of Spiritism" (1880); "Photographs After Nature" (1882); "Progress of Photography Since 1879" (1883); "Chemical Action of Light and Photography" (2d ed. 1883); "Photography of Colored Objects" (1885); "Practical Spectrum Analysis of Terrestrial Objects" (1889); "Artistic Photography" (1890).

**Vogel, Jakob,** styled VOGEL VON GLARUS, a Swiss poet; born in Glarus, Switzerland, Dec. 11, 1816. He was a noted connoisseur and collector of the poetry of Switzerland. His works are: "Beauties and Terrors of the Swiss Alpine World," prose (1868); "Pictures from the Alps," poems (1874); "Reminiscences of the Klönthal" (1878); "Poems" (14th ed. 1890); "My Home: Selected Poems of Nature" (1893).

**Vogel, Sir Julius,** an Australasian statesman; born in London, Feb. 24, 1835, of Jewish parentage. He went to Melbourne during the gold rush, and after being engaged in various business pursuits and on the gold fields, devoted himself to journalism. He afterward went to Dunedin, N. Z., became a member of the House of Representatives and of the Provincial Council of Otago. He held ministerial office frequently after 1869, and was agent-general in London from 1876 to 1881. He established the first daily newspaper in New Zealand, and the mail service between San Francisco and New Zealand, and his name was connected with all the public enterprises of his day in New Zealand. During the 10 years preceding 1881 he was the means of introducing 100,000 immigrants and of building 1,200 miles of railways in the colony, and was influential in bringing about Australian federation. He was knighted in 1875. Beside pamphlets and magazine articles, he wrote a handbook of New Zealand and a novel, "A. D. 2000, or Woman's Destiny." He died in England, March 13, 1899.

**Vogel, Otto,** a German dialect poet; born in Greifswald, Prussia, Jan. 3, 1838. Among his lays in Low German are: "Mirror of Pomerania: From Every Age" (1869) and "Rose Leaves." In High German he wrote "Reproaches: A Garland of Lays" (1887).

**Vogelweide, Walther von der.** See WALTHER VON DER VOGELWEIDE.

**Voghera,** a town of Italy; province of Pavia; on the Staffora; 81 miles E. of Turin. It was fortified by Giovanni Galeazzo Visconti, and an old castle still exists built by him toward the end of the 14th century. The church of St. Lorenzo, found-

ed in the 11th century, and remodelled in 1600, is the only building of importance, but the town is handsome and well laid out. There are considerable manufactures, chiefly of cloth and hats. Pop. 12,794.

**Vogler, Georg Joseph,** a German musical composer, usually styled the Abbé (Browning's Abt) Vogler; born in Würzburg, Germany, June 15, 1749, the son of a violin maker. He studied at Bamberg, Mannheim, Bologna, and Pedua; was ordained priest at Rome in 1773; and made Knight of the Golden Spur, and protonotary and chamberlain to the Pope. Returning to Mannheim, he established there his first school of music; his second was that at Stockholm, where in 1786 he had been appointed kapellmeister. After years of wandering and brilliant successes as a player on his "orchestrion" at London and half over Europe, he settled as honored kapellmeister at Darmstadt, and opened his third school, the chief pupils of which were Gänsbacher, Weber, and Meyerbeer. He died in Darmstadt, Germany, May 6, 1814.

**Voglianite** (named after Dr. J. F. Vogl, of Bohemia), a mineral occurring in globular or earthy encrustations on uraninite; soft; color and streak, shades of green. Composition: A basic sulphate of uranium. Found near Joachimsthal, Bohemia.

**Voglite,** the name given to aggregations of rhomboidal scales, occurring implanted on uraninite at Joachimsthal, Bohemia. Luster, pearly; color, emerald to grass-green. An analysis yielded carbonic acid, 26.41; protoxide of uranium, 37.0; lime, 14.09; protoxide of copper, 8.40; water, 13.90 = 99.80, which yields the formula $2UOCO_2 + 2CaOCO_2 + 3CuO,2CO_2 + 14HO$.

**Vogt, Karl,** a German naturalist; born in Giessen, Germany, July 5, 1817; educated at Giessen and at Bern, two of his teachers being Liebig and Agassiz. In 1847 he became Professor of Zoölogy at Giessen, but soon lost the post from his extreme politics; he then (1852) accepted the chair of geology at Geneva. He headed an expedition to the North Cape in 1861. In 1878 he was a member of the Swiss National Assembly. He was a thorough-going materialist, and a champion of Darwinism in its fullest consequences. Among his many books are: "Lectures on Man" (1864); "Zoölogical Letters" (1851); "Old and New From the Life of Man and Animals" (1859); "Manual of Geology"; "Bigotry and Science"; "Guide to Practical Comparative Anatomy" (1885), written in collaboration with Professor Young. He died in Geneva, Switzerland, May 5, 1895.

**Vogüé, Charles Jean Melchior, Marquis de** (vō-gü-ā′), a French archæologist; born in Paris, Oct. 18, 1829. Hs studies are mainly in the departments of the history of religion and Oriental art. He is author of: "The Churches of the Holy Land" (1859); "The Temple of Jerusalem" (1864); "Civil and Religious Architecture in Central Syria, from the First to the Sixth Century" (2 vols. 1865–1877); "Semitic Inscriptions" (1869–1877). In 1901 he became a member of the French Academy.

**Vogüé, Eugène Melchior, Vicomte de,** a French diplomatist; born in Nice, France, Feb. 25, 1848. He was Minister of Foreign Affairs (1871) and later in the diplomatic service, but left it in 1881 to devote his time to literature. He published: "Syria, Palestine, Mount Athos" (1876); "Oriental Histories" (1879); "The Son of Peter the Great" (1884); "The Russian Romance" (1886); "Souvenirs and Visions" (1887); "Remarks on the Centennial Exposition" (1889). He was a member of the French Academy.

**Voice,** an audible sound produced by the larynx, and effected by its passage outward through the mouth and other cavities. When so modified in particular ways it becomes speech or song. The main difference between these two latter are that speech is more limited in compass or pitch, that it is less sustained in respect of pitch, and is not confined to the notes of a musical scale, that it is associated with a less clear or open passage for the breath, and that it presents certain utterances (consonantal, aspirate, guttural, etc.) which have not a purely musical character. The larynx is the organ by which the so-called vocal sounds (or primary elements of speech) are produced; and it was in former times keenly debated to which class of musical instruments the larynx might best be compared. Dr. Witkowski says ("Mechanism of Voice, Speech, and Taste"): "Galien compares it to a flute, Majendie to a hautboy, Despiney to a trombone, Diday to a hunting horn, Savart to a bird catcher's call, Biot to an organ pipe, Malgaigne to the little instrument used by the exhibitors of Punch, and Ferrein to a spinet or harpsichord. The last named compared the lips of the glottis to the strings of a violin; hence was given the name vocal chords. which they still retain. The current of air was the bow, the exertion of the chest and lungs the hand which carried the bow, the thyroid cartilages the *points d'appui,* the arytenoids the pegs, and lastly, the muscles inserted in them the power which tensed or relaxed the cords."

But the vocal cords are very different in their structure from strings, and no string so short as the vocal cords are could produce a clear bass note. They more resemble in their action a pair of reeds; not such

Voice

an instrument as a clarionet, in which the vibrations of the column of air of any determinate length overpower the single reed, and compel it to vibrate only in rhythm with themselves, but such an instrument as may be constructed with two strips of india-rubber laid across the mouth of a wide tube so as to present a mere chink between them. The larynx contains within itself a great power of adjustment, such as is possessed by no musical instrument; the tension of the vocal cords can be varied; the vibrating portion of the vocal cords can be shortened; the distance between them can be varied; their form can be altered, as by blunting their free edges or by flattening their whole structure; and they can be prevented from vibrating in their whole breadth, the vibrations being then confined to their margins merely; and these adjustments may be combined so as to suit different pressures of air from the lungs. Further, above and below this primary sounding apparatus there are adjustable cavities, which act as resonators, and thus affect the quality of the sound produced.

The actual action of the larynx as a sounding instrument has only been clear since Garcia introduced (1855) the laryngoscope as a means of observing what went on during actual vocalization; and a flood of light has been thrown on the subject by the researches of Czermak, Merkel, Madame Seiler, and Behnke. The crico-thyroid muscles pull the thyroid cartilage and the cricoid cartilage together; the vocal cords are thus tightened; and the posterior crico-arytenoid muscles aid in this. The thyro-arytenoid muscles relax the vocal cords, and twist the arytenoid cartilages round so as to make their attachments to the vocal cords come over toward one another instead of lying at some distance from the middle line; and they can also so act as to press portions of the vocal cords together, and thus shorten the free vibrating edges; and further, they can squeeze their own inner portions thin, and thus flatten and thin the vibrating part of the vocal cords. The posterior crico-arytenoid muscles, in addition to aiding in tightening the vocal cords, twist the arytenoid cartilages so as to widen the back part of the chink between the vocal cords; while the lateral crico-arytenoids as well as the thyro-arytenoids perform the reverse operation, and thus narrow the chink, and are assisted in this by the arytenoideus muscle, which directly pulls the arytenoid cartilages together. These muscles in combination effect the various adjustments above spoken of. In a state of rest the glottis lies open, and respiration is unimpeded; in deep breathing the chink is still wider, but as soon as we wish to utter a note the two arytenoid cartilages rapidly approach one another, and the glottis-chink is narrowed. At the same time the superior or false vocal cords approach, but never touch one another. If the vocal cords meet one another before the current of air flows to produce the tone, there is a disagreeable jerk or click at the commencement of the note; if the air flows before the vocal cords have sufficiently approximated, there is an aspirate, and the "attack" or beginning of the note is uncertain; the two actions ought to coincide in time, and then the "attack" is clear and precise, for the vocal cords are brought to the right place for vibration at the very time when the air begins to tend to set them in motion.

In different larynxes much depends on the relative sizes of the vocal cords; thus a man with a bass voice has longer vocal cords than a child or a woman; but as between basses and tenors, tenors and contraltos, or contraltos and sopranos, the higher voice may sometimes appear to have the longer vocal cord; on the other hand, slenderness of structure makes up for greater length, and when the vocal cords are long and slender, the voice is "flexible," for the cords readily enter into vibration. Further, a narrow larynx is conducive to high pitch, and so is not only the size but also the form of the female larynx, in which the upper part, above the false vocal cords, and between them and the hyoid bone, is comparatively flat. In children the larynx is small, and the voice high-pitched; but the larynx grows very rapidly at puberty; and as its different parts do not then grow with proportionate rapidity, the muscular control is uncertain, and the voice, especially in boys, breaks.

In one and the same larynx different parts or regions of the scale are produced by different laryngeal mechanism; and those notes of the scale which are produced by the same mechanism (Behnke) are said to be produced in the same register. The registers of the voice have given rise to a great deal of discussion, most of which appears to have arisen from independent attempts to express sensations in words. It appears, however, from the laryngoscopical evidence (for which see Lennox-Browne and Behnke, "Voice, Song, and Speech") that the whole mechanisms can be divided into three groups, or "thick," "thin," and "small" registers, as Mr. Curwen happily named them before the laryngoscopical evidence had come to hand. In the first the vocal cords vibrate as thick masses; in the second they vibrate in their thin edges only; in the third the vibrating chink of the glottis is much reduced in length.

The resonating cavities and appurtenances connected with the larynx form a complex system consisting of the pockets lying between the true and false vocal

cords (the effect of which cannot be very great, but which must be affected by the position of the false vocal cords), the vestibule of the larynx, the epiglottis (which directs the sound waves toward different parts of the resonating system, and affects the color or timbre of the tone produced), the pharyngeal cavity, the nasal cavity, and the mouth. When the sound waves find a clear air way over the tongue and under the soft palate the tone is clear; when the soft palate hangs down, so that some of the air escapes by the nose, the tone is nasal; when the tongue does not lie flat and out of the way the tone is throaty and strained; when the lips obstruct the sound waves the tone becomes muffled. The quality of tone is also very much affected by the control which the speaker or singer may have over the breath; he should have his lungs well filled with air by abdominal respiration, and be able to attack the sound clearly with a minimum expenditure of breath, and direct the sound waves well forward, keeping the resonating cavities large and clear; under these circumstances the voice carries through a maximum distance with a given effort, especially if, in the case of a speaker, he raises not the pitch of his voice, but its loudness when the occasion requires it; and under such conditions the pressure of air in the windpipe can be raised to a considerable height, and the voice rendered clear and telling without exhausting exertion.

Modifications in the form of the resonating cavities result, by resonance, in those modifications of timbre which we call vowels. In pronouncing *u* (= *oo* or Italian *u*) we round the lips and draw down the tongue, so that the cavity of the mouth assumes the form of a bottle without a neck; if the lips be opened somewhat wider and the tongue be somewhat raised, we hear *o;* if the lips be wide open and the tongue in its natural flat position, we hear *a;* if the lips be fairly open and the back of the tongue raised at the same time, the vowel produced is *e;* and if we raise the tongue still higher, and narrow the lips, we hear *i*. Each of these resonance chamber forms has its own dimensions and its own resonance pitch; and of these *u* has the lowest pitch, as may be heard by whispering the vowels, or by means of a series of tuning forks successively reinforced by the cavity of the mouth as a resonator; for which reason it is easier to sing *u* and *o* on low than on high notes. Diphthongs are produced by continuing the laryngeal sound during the transition from one vowel-mouth-form to another. Consonants are produced by various interruptions, total or partial, of the outflowing stream of air. If the air be completely stopped by the lips and soft palate, we have *p* when the obstruction is suddenly removed;; the same action, accompanied by a certain continued sound in the larynx, and a heavier air pressure within the mouth, gives *b;* if the air be checked by the lips, but not by the soft palate, so that it passes through the nose alone, we have *m;* if it be checked by the soft plalate and by bringing the point of the tongue to the front of the palate, or to the gums, we have *t;* the same with continued laryngeal sound and greater air pressure gives *d;* the action for *d*, modified by allowing a little air to escape over the soft palate through the nose, gives *n;* if the air be checked by the soft palate and by bringing the middle or back of the tongue to the arch of the palate, we have (silent) *k* and (if there be laryngeal sound) *g;* the latter, but with the nasal passage open, gives *ng*.

In other cases a continuous stream of air is made to escape under some pressure past an obstacle, and thus to sibilate; if it be driven through a narrow chink between the upper front teeth and the lower lip, the larynx being silent and no air escaping through the nose, we have *f;* the same, with greater air pressure and a laryngeal sound, gives *v;* the true aspirated *p* and *b* (air driven with or without voice through a very narrow and small lip chink) do not exist in English, but the latter fairly represents the German *w* in *wasser;* if the tongue be pressed tightly against or between the front teeth and air be driven through these, we have, without voice, *th* in thin, or with voice *th* in then; if in the last instance the contact be loose, we have *s* and *z* respectively; if the tongue be put in the *t* position and a little reverted, we have for tight contact *ch* and *j* (judge), and for loose contact *sh* and *zh* (French *juge*) ; if it be put in the *k* position we have for loose contact, voiceless, the Scotch *ch* in *loch;* if in the *ng* position, the Dutch *ch*, voiced, in which the soft palate vibrates, and the Welsh *ch*, voiceless. In *l* the tip of the tongue is fixed, and its sides oscillate, while a laryngeal tone is being produced; in the Welsh *ll* the position and action are the same, while a strong current of air is employed, and the larynx is silent. In *r* the tip of the tongue vibrates against the front teeth so as intermittently to shut off the air stream, while laryngeal tone is maintained; in Welsh *rh*, as in Rhyl (Greek *ῥ*), the action is the same, with a strong current of air and larynx silent. In a "burred" *r* (Northumberland, Parisian French, North German) the air is interrupted by vibrations of the soft palate. The aspirate *h* is produced by narrowing the air passages, by raising the tongue and using a momentary strong current of air at the beginning of the vowel. If not infrequently happens that there is difficulty experienced in coördinating the requisite movements of larynx, tongue, and mouth, which are usu-

ally automatic, and depend upon the will to attain, by imitation, a given result; in such a case a person stutters his consonants or stammers his vowels. In many such cases the respiration is not under control, and attention to this may enable the defect to be remedied.

**Voided,** in heraldry, a term applied to a charge or ordinary pierced through, or having the inner part cut away, so that the field appears, and nothing remains of the charge but its outer edges.

CROSS VOIDED.

**Voigt, Georg** (voit), a German historian; born in Königsberg, Prussia, April 5, 1827. He was Professor of History at Leipsic. His chief works are: "The Renaissance of Classic Antiquity; or, The First Century of Humanism" (1859); "Enea Silvio de' Piccolomini as Pope Pius II., and His Times" (3 vols. 1856–1863); "Memorabilia of Giordano de Giano the Minorite" (1870); "Historiography of the Expedition of Charles V. Against Tunis, 1535" (1872); "Maurice of Saxony, 1541–1547" (1876). He died in Leipsic, Aug. 18, 1891.

**Voigt, Johannes,** a German historian, father of Georg; born in Bettenhausen, in Saxe-Meiningen, Germany, Aug. 27, 1786. He is author of "Hildebrand as Pope Gregory VII. and His Times" (1815), in which he regards the reign of Gregory VII. as one of the most noteworthy phenomena of the Middle Ages, and Gregory himself as a great reformer; "History of the Lombard League and its Struggle with the Emperor Frederick I." (1818); "History of Prussia from the Earliest Times to the Downfall of the Domination of the Teutonic Order" (9 vols. 1827–1839); "The Westphalian Vehmgerichte or (Mediæval Tribunals) as Related to Prussia" (1836); "Margrave Albrecht Alcibiades of Brandenburg-Kulmbach" (1852); "History of the Teutonic Order in Its Twelve Circles in Germany" (2 vols. 1857–1859). He died in Königsberg, Germany, Sept. 23, 1863.

**Voigtite** (after Herr Voigt, of Saxe-Weimar), a mica-like mineral, occurring in a pegmatite near Ilmenau, Thuringia; hardness, 2–3; sp. gr., 2.91; luster, pearly; color, leek-green, but more often brownish. Composition: The same as that of biotite, with the addition of water. Dana suggests that it is probably the latter mineral hydrated.

**Voir Dire,** in law, a preliminary examination of a witness to ascertain whether he is competent. When a witness is supposed to have an interest in the cause, the party against whom he is called has the choice to prove such interest by calling another witness to that fact, or he may require the witness produced to be sworn on his *voir dire*, as to whether he has an interest in the case or not; but the party against whom he is called will not be allowed to have recourse to both methods to prove the witness's interest. If the witness answers he has no interest, he is competent, his oath being conclusive; if he swears he has an interest, he will be rejected.

**Voit, Karl von** (foit), a German physiologist; born in Amberg, Bavaria, Oct. 31, 1831. He was appointed Professor of Physiology in the University of Munich in 1863. His first memorable scientific researches (1854) demonstrated the presence of urea in the muscular tissues of cholera patients; afterward he studied almost exclusively the questions of digestion and assimilation. His principal works are: "Physiologico-Chemical Researches" (Part i. 1857); "Researches on the Effects of Common Salt, Coffee, and Muscular Action, on Digestion" (1860); "Laws of Nutrition in Carnivora" (1860).

**Voiture, Vincent** (vwä-tür′), a French poet; born in Amiens, France, in 1598. His letters and short poems are the chief basis of his literary reputation; but his writings were privately circulated, none being published during his lifetime. He enjoyed the friendship of Cardinal Mazarin, and through his patronage attained the zenith of his reputation, and enjoyed large pensions. He died May 26, 1648.

**Vokes, Rosina,** an English actress; born in London in 1858. Her first appearance was in pantomime, when a mere child, with her brother FREDERICK and her sisters VICTORIA and JESSIE. They made an instant success in London as "the Vokes family." They afterward came to the United States, where they became great favorites with the public. Rosina married Cecil Clay, a lawyer and playright, in 1877, and for a time retired from the stage. In 1886 she organized a company for farces and comedies which annually toured in England and the United States till her death, in Babicombe, England, Jan. 29, 1894.

**Volant,** in heraldry, a term meaning flying.

**Volant Piece,** in old armory, an extra plate of metal affixed to the front of a knight's helmet, and screwed to the *grande garde*, which covered the breast. It was chiefly used in tournaments, and being made with a sharp salient angle, the lance of the opponent, unless provided with a coronel, was almost certain to glance off.

**Volapük,** More than 200 years ago Descartes and Leibnitz began the discussion of an international language for Europe, when Leibnitz showed his interest in the matter and his confidence in the possibility of such

an invention by devoting to the subject much serious study, finally publishing his views in 1666 in a "Dissertatio de Arte Combinatoria." From that time till 1879 numerous attempts were made to accomplish the task which the great philosopher set before himself, but all signally failed. Some of the languages produced during this period were exceedingly ingenious, but for one reason or another they took no permanent hold on the people, and are now unknown beyond the small circle of linguists who feel an interest in such curious productions. Perhaps the principal reasons for their failure are these: They were too metaphysical; the international spirit was not sufficiently awakened; the need was not greatly felt. Add to these the important fact that the feeling of the people toward a mechanical language was much the same as the workman's toward other labor-saving machines, and surely the failure of all these artificial languages is sufficiently accounted for. It was left for this practical, liberal, and needy age to invent and make use of such a medium of communication.

The story of the invention of Volapük, the youngest member of the artificial family, has been so often told that it need not be repeated at length here. How Johann Martin Schleyer, an obscure but scholarly German priest, devoted 20 years of study to the subject; how the whole scheme flashed across his mind one sleepless night, and how in a few days afterward Volapük was born, is almost as well known as the story of Newton and the falling apple.

Schleyer's years of linguistic study as a preparation for his task, were spent in examining the structure — the mechanism of the important languages of the world. When he had closed his researches in this field, he chose the Aryan family as the general model for his invention. His aim was to produce a language free from all the defects of one of natural growth, with all irregularities and speech peculiarities eliminated. He called his invention Volapük — "World's Speech." Since then its aim is so high, it must of necessity in its sounds, in its words, and in its structure be so simple and so regular as to be easy of acquisition by persons in all parts of the earth. To this end, sounds peculiar to our language and difficult for persons not natives were not employed. The Roman alphabet was used with the exception of *w* and *q*. To this the letters ä, ö, a d ü were added, making an alphabet of 27 letters. The vowels are sounded as the long vowels in Italian and have but one sound. The consonants are sounded, in the main, as in English. In the compromise made necessary by the purpose of Volapük each language had to surrender something. French gave up its nasals; German, its gutturals; Italian, its liquids, while all alike gave up their articles and analytic form. Volapük is a synthetic and inflectional language like Latin. By this means it can express thought with great clearness and conciseness. The order of the words in a sentence, however, is of the modern type.

The radicals, or root words, form the basis of the language. These are usually nouns. About 40 per cent. of these have been taken from English; the rest are from other Aryan languages, chiefly German, Latin, and French. By what methods the radicals, or root words, were made ready for use and from what source they were taken will now be shown. The general principle determining the choice of a root seems to have been brevity, clearness, and ease of utterance. For these reasons the Volapük word for man is *man,* a Germanic form, while the word for house is *dom,* a Latin form. The word for time is *tim,* from the Rumanian (timp); for bridegroom, *gam* from the Greek. These radicals are generally of one syllable and begin and end in a consonant, that the case endings of the nouns and arguments and personal endings of the verbs may be applied directly to the root.

They are, in the main, formed from ordinary words by three methods: (1) A consonant is substituted for a final vowel or for a difficult consonant. Thus English pay becomes in Volapük *pel;* French *mer* becomes *mel.* (2) Consonants and vowels are dropped out altogether. Thus German *ganz* becomes *gan,* Latin *pons* becomes *pon,* English state becomes *tat,* forest becomes *fat.* (3) The most important syllable is chosen to represent the idea conveyed by the whole word. Thus Latin *sapientia* becomes *sap;* French *tapis* becomes *tap.*

Below we give a short table of Volapük roots from English, German, Latin, and French:

| English. | German. |
|---|---|
| giv — gift. | bin — being. |
| kom — arrival. | fel — field. |
| läd — lady. | fad — wire. |
| pen — pen. | gan — goose. |
| sag — (the) saying. | ket — chain. |
| spod — correspondence | stil — silence. |
| ston — stone. | nad — needle. |
| vom — woman. | |
| vol — world. | |
| **Latin.** | **French.** |
| duk — guide. | mat — marriage. |
| fin — end. | mel — sea. |
| fug — flight. | pom — fruit. |
| flum — river. | tap — carpet. |
| reg — king. | tuv — discovery. |
| sum — taking. | |
| ten — stretching. | |

It will be noticed from an examination of this table that the roots are nouns. Such is usually the case. From these the verbs, adjectives, and adverbs are made by the proper prefixes and suffixes. The cases of the Volapük noun are the same in number,

and in general use as in English: Nominative, genitive, dative, and accusative. The nominative is the unmodified root. The case endings for the other cases are *a-e-i*, respectively, taken from Latin and Greek, though differently applied to aid the memory. The plural is formed after the manner of the French, by adding *s* to the singular, and to this rule there are no exceptions. It is also like the French in having no neuter gender. All nouns which do not designate females are masculine.

The pronouns, like the prepositions, numerals, and conjunctions are, for the most part, either words coined outright, or unrecognizable mutilations. We should not speak of them at all were they not necessary to the formation of the verb. The personals, the only ones worthy of notice here as follows: *ob* — I; *al* — thou; *om* — he; *of* — she; *os* — it (impersonal); *on* — one, they, like French *on*. These are declined as the nouns.

In the formation of the verb, the author has made skillful use of a system of augments. The principle is borrowed from Greek, though differently used and to a much greater degree in Volapük. Here the augments are nothing more than tense signs, extending through all the moods. Thus the present tense is marked by the vowel *a*, the imperfect by *ä*, the perfect *e*, the pluperfect by *i*, the future by *o*, and the future perfect by *u*. The order of the vowels will greatly aid the memory. The indicative, having the above-named tenses, is formed directly from the radical by prefixing the tense sign and adding the personal pronoun. Thus take the root *fin* meaning end; *o-fin-om* — he will end; *e-fin-ob* — I have ended. The indicative is the basis of the imperative, the conjunctive, the conditional, and the optative. These are formed by adding to the indicative the endings *öd, la, ör,* and *ös* respectively. For example, *fin-om* — he ends; *fin-om-ös* — may he end. (The tense sign of the present tense is not used in the active voice.) The infinitive and participle are made by adding *ön* and *öl* directly to the root. Thus *fin-öm* — to the end; *e-fin-ol* — having ended. The passive voice is formed by prefixing the letter *p*. The reflexive form is made by adding *ok*, the interrogative by adding *li*. Most of these terminations for the moods were invented by the author. The termination of the infinitive is enough like the German to have been suggested by it, while that of the imperative is undoubtedly from early Latin, with the first consonant dropped.

The adjective is made from the noun by the addition of *ik* from the Greek. Thus *gud* — goodness; *gudik* — good. It is compared thus: *guidik* — *guidik-um* — *guidün*. This latter ending seems a poor invention. The comparative ending may be the Latin superlative ending turned to another use, as the comparative in *r* (ior—er) had to be rejected on account of the difficult final sound.

The adverb is formed from the noun and adjective by the addition of *o*.

There are now in the Volapük dictionary about 17,000 words. The number of radicals, however, is by no means so large. The highest estimate puts this number at 1,300. From these words are made by prefixes, suffixes, and by composition. Thus: Root *dom* — house; *le-dom* — palace; *lu-dom* — cottage; *domäl* — economy; *dom-an* — domain; *doma-kip* — housekeeping; *doma-dunel* — house servant. The prefixes *le* and *lu* are used in both a literal and figurative sense, and are used to form about 600 words. Some confusion would be avoided had the author chosen other prefixes for a figurative use and confined *le* and *lu* to a literal sense.

The question is often asked, What are the merits of Volapük, and why is it better adapted than its 50 predecessors for an international language? The answer is this: Its scientific simplicity and precision, and the ease with which it can be learned make it by far the best fitted for practical use of all artificial languages. This will readily appear from its grammatical structure, and *à priori* might be inferred from its being the only artificial language that has ever passed beyond the experimental stage. Its spread has been marvelous. The first society for its propagation was formed in Austria in 1882. It has since made its way into nearly all the countries of Europe. Its students number about 250,000, spread over America, Europe, North America, Syria, and Arabia. Twelve magazines and papers are published in its interest, most of them in the large cities of the Old World.

Volapük is intended primarily for use in commerce. It is called by Professor Kerchoffs, the leader of the movement in France, "*langue commerciale internationale.*" It puts itself forward as having peculiar fitness as the business language for the nations, and on the basis of this claim it should be judged. It may be called harsh and cold, with its cast iron syntax and strange forms — but these are defects not peculiar to it but necessary to every artificial language. Clearness, conciseness, simplicity, and ease of acquisition are the qualities which the inventor sought to secure. Through the possession of these, or from the lack of them, must Volapük rise, spread, and become the medium of communication for the nations or fall into the same oblivion which has overtaken other artificial languages.

**Volatile Oils,** essential oils; oils which can be distilled without decomposition. They

*From stereograph copyright by Underwood & Underwood, N. Y.*

Mont Pelée, Martinique, in Eruption (June, 1902).

are classed under two heads: mineral and vegetable; the former being composed of carbon and hydrogen, and generically known as paraffins. The vegetable oils, which are generally procured by distilling the odoriferous substance with water, may be divided into three great classes: (1) Oils composed of carbon and hydrogen (binary volatile oils), of which oil of turpentine may be considered the type; (2) oils containing carbon, hydrogen, and oxygen (oxygenated oils), which include most of those used in medicine and perfumery; and (3) oils containing sulphur (sulphuretted oils), characterized by their extreme pungency and suffocating odor, such as oil of mustard, asafœtida, etc. The volatile oils are generally more limpid and less unctuous than the fixed oils, and are almost colorless after rectification. They are soluble in alcohol and ether, slightly soluble in water, and mix in all proportions with the fixed oils.

**Volborthite,** a mineral occurring in small tabular crystals on a sandstone of the Permian formation in the Urals; crystallization, hexagonal; hardness, 3–3.5; sp. gr., 3.55; luster, pearly; color, olive-green, citron-yellow; streak, yellowish-green. Analyses made by Genth gave results which justified the following formula: $(Cu,Ba,Ca)_3V_2O_8 + 3CuH_2 + 12$ aq., which requires, vanadic acid, 19.63; protoxide of copper, 38.41; baryta, 6.17; lime, 6.77; water, 29.02 = 100.

**Volcanic Glass,** the same as obsidian. The hardness and sharpness of its fragments have led to its use by the American Indians of the Southwest in their native surgery.

**Volcanic Rocks,** in geology, rocks which have been produced at or near the surface of the earth in ancient or modern times by the action of subterranean heat, by water, and pressure. They form one of the leading divisions of rocks, and resemble plutonic rocks in being generally unstratified and destitute of fossils, but are distinguished from them. Volcanic are more partially distributed than aqueous rocks. Old volcanic rocks are so nearly identical with the products of modern volcanoes, that the two were undoubtedly produced in a similar manner. The leading volcanic rocks are basalt, andesite, and trachyte.

**Volcanic Regions,** certain regions of the world throughout which volcanic and earthquake action specially prevails. They run in lines. The region of the Andes extends from lat. 43° S. to 2° N.; that of Mexico follows, then that of the West Indies. Another extends from the Aleutian Islands to the Moluccas and the Isles of Sunda, another from Central Asia to the Canary Islands and the Azores. There is one in the Grecian Archipelago, having its chief focus at Santorin, known to have been active at intervals for 2,000 years; then that of Italy and Sicily, having vents in Etna, Vesuvius, and Ischia. One region is in Iceland, with Hecla as its chief vent. Volcanoes are generally near the sea. Jorullo, in Mexico, is, however, an exception, being 120 miles from the nearest ocean.

**Volcanoes.** Ages ago the earth on which we live was a huge mass of "fire mist." Astronomers tell us that today in the heavens we can see vast nebulæ, suggesting what the earth was once. Gradually the surface of the "fire mist" cooled and hardened, but the interior is still intensely hot. Whether it is solid, liquid, or viscous we do not know. This heat, raging miles below the surface, at times escapes through the hard crusts by vents or volcanoes.

There are from 300 to 360 volcanoes on the globe. This estimate includes merely live volcanoes and volcanoes which within recent times have been in action. If we should count the many mountains scattered over the earth which today show signs of volcanic action in more remote past, the estimate would have to be increased by many hundreds.

Volcanoes would seem to be arranged with more or less symmetry in belts circling the great oceans. A ring of fire surrounds the Pacific. Starting at the South Shetland Islands, several hundred miles S. of Cape Horn, a belt of volcanoes extends up the W. coast of South America, Central America, and North America; from Alaska it crosses the Pacific along the Aleutian Islands to Kamchatka; thence it follows the E. edge of the Pacific through the Kurile Islands, Japan, Formosa, the Philippines, the Moluccas, the Solomon Islands, the North Hebrides, New Zealand, and finally ends in Mts. Terror and Erebus, on the Antarctic continent. The volcanoes forming this great belt are in places ranged in chains, as along the W. coast of Central America and in the Aleutian Islands; elsewhere they are separated by long distances, but nevertheless they would seem to have some connection with each other. Sometimes the line of volcanoes surrounding the Pacific is very narrow, as in Central America, and then again it broadens hundreds of miles, as in the W. United States, where extinct volcanoes on the E. edge of the belt are hundreds of miles from the ocean and distant from each other.

Within this great Pacific circle of volcanoes, 25,000 miles in length, are many volcanic islands: the Ladrones, the Hawaiian Islands, with the famous Mauna Loa; the Galapagos, the Samoan Islands, as well as the Tonga and Fiji Archipelagoes, and many smaller groups. The coral islands may be also classed as volcanic, as they rest in great part on volcanic foundations.

Eastward from the circle around the Pacific a branch belt extends through Sumatra and Java. On the broken isthmus which ages ago joined Asia and Australia are over 100 volcanoes, many of which are constantly belching forth mud, lava, or ashes. This is the great focus of volcanic action of the earth. Round nearly three sides of the Atlantic basin volcanic districts are scattered with some apparent symmetry. In the far N. Hekla and nearly one score others separate the Atlantic from the Arctic Ocean. Stretching from Iceland, from N. to S. an irregular submerged ridge bears the volcanic mountains of the Azores, the Cape Verde Islands, Ascension, St. Helena, and Tristan da Cunha. On the W. edge of the Atlantic are the volcanoes of the West Indies; but N. or S. of the Antilles there is not a single volcano on the E. shore of America. The volcanic belt of the Mediterranean shore is prolonged to the mountains of Armenia and Western Arabia. There are said to be some volcanoes in Tibet and Manchuria, but the explorer has not yet located them.

Elisée Reclus has drawn attention to the fact that the great centers of volcanic action in the Western and Eastern hemispheres are at exactly opposite ends of the globe—are at antipodes to each other — and that these centers of activity are near the poles of flattening. They also flank, one on the W. and one on the E., the immense circle around the Pacific.

Volcanoes may be roughly described as of two types — the expulsive and the explosive. Of the first, Hekla, in Iceland, Stromboli, and Mauna Loa in the Hawaiian Islands, are good examples. They pour forth masses of lava which flows like molasses. Of the second type are Vesuvius, Mont Pelée, the volcanoes of the West Indies, and those of the Andes and Mexico; these eject the material andesite, and are more explosive than those ejecting the ropy lavas.

Theories abound as to the cause of volcanic action, but of actual causes we know little. Science has no X-rays to pierce into the bowels of the earth.

Lafcadio Hearn, in one of his interesting sketches of the French West Indies, published some years ago, tells the story of perhaps the only man who ever descended into the earth while it quaked. It seems that during a certain convulsion that shook and rent a certain island of the West Indies one man was thrown far down a fissure. He was unharmed, but his position, as he tumbled far down in the fissure, was not such as to inspire hope or a scientific study of what had happened or was happening. After some time passed there in the bowels of the earth, another convulsion shook and rent the ground. It tossed him up and up out of the fissure and landed him unharmed on solid and firm ground; but when asked how it had all happened, the process of all this tossing, he could not explain. Science had lost its one chance of learning by personal observation what is happening beneath us.

Perhaps the most probable explanation of explosive eruptions of volcanoes is as follows:

The rocks deep beneath the surface are kept moist by the water that slowly seeps through. Probably the rocks contain from 3 to 20 per cent. of water. The heat of the molten mass beneath the rocks gradually generates steam, and as time goes on more and more steam is generated. The pressure of this steam is constantly increasing till a time comes when the weight above cannot hold in the expanding force of the steam. Like a boiler, the whole mass explodes with terrific fury. An earthquake may open a fissure, which, by letting down water rapidly, will hasten the explosion; but it is doubtful if an earthquake can do more than this. Water entering by a fissure could hardly invade the vast area upheaved by an explosive eruption.

The Guatemalan earthquake of April probably timed the explosion of Mont Pelée and La Soufrière. It was the last straw; it brought the last ounce of pressure — one ounce more than the boiler could bear. The local earthquakes in Martinique and St. Vincent were the ruptures and tremors caused by the fettered steam.

Two other factors may assist this process: The shrinking of the earth, which allows the molten mass to rise through fissures and generate steam more rapidly, and the change of load at the surface, caused by deposition or degredation, which thus disturbs the law of equilibrium.

Of eruptions in general Professor Russell says:

"The cause of the rise of the molten rock in a volcano is still a matter of discussion. Certain geologists contend that steam is the sole motive power, while others consider that the lava is forced to the surface owing to pressure on the reservoir from which it comes. The view perhaps most favorably entertained at present in reference to the general nature of volcanic eruptions is that the rigid outer portion of the earth becomes fractured, owing principally to movements resulting from the shrinking of the cooling inner mass, and that the intensely hot material reached by the fissures, previously solid owing to pressure, becomes liquid when pressure is relieved and is forced to the surface. As the molten material rises, it invades the water-charged rocks near the surface and acquires steam or the gases resulting from the decomposition of water, and a new force is added, which produces

the most conspicuous and at times the most terrible phenomena accompanying eruptions.

"The recent volcanic outbreaks on Martinique and St. Vincent were eruptions of the explosive type. The volcanoes have been dormant for years, and the lava in the summit portion of their conduits was cold and hard. Movements in the earth's crust caused a fresh ascent of lava from deep below the surface, the molten material came in contact with water in the rocks it invaded, and steam explosions resulted.

"These explosions were similar to what would happen if water should be poured on a mass of molten slag such as comes from an iron furnace."

Prof. William M. Davis and William H. Snyder, in their excellent "Physical Geography" give a number of interesting instances of volcanic eruptions. The following is quoted:

"Monte Nuovo (New Mountain) is a small volcano that was formed on the N. side of the Gulf of Naples, in Italy, in 1538. Earthquakes occurred thereabouts for two years before the eruption, when in a week's time a cone was built up 440 feet high, half a mile in diameter at the base, and with a crater over 400 feet deep. Masses of lava 'as large as an ox' were shot into the air by the bursting of great bubbles of gas or steam that ascended through the lava in the vent. Finer ashes fell over the country for several miles around. The people of the neighboring villages fled in terror from their homes.

"A great eruption took place in Mexico in 1750, when the volcano Jorullo (pronounced Ho-rul-yo) was built on the central plateau, burying fertile fields of sugar cane and indigo. The outburst was preceded by earthquakes; the eruption continued half a year, building six cones and pouring out extensive lava flows. The highest cone, Jorullo, rose 700 feet above the plateau. The flows retained a perceptible heat for over 20 years.

"Many examples might be given of marine eruptions. In 1867 a shoal was discovered among the Tonga Islands of the Pacific (latitude 20° 20′ S., longitude 175° 20′ W.), the surrounding sea floor being 1,000 fathoms deep. In 1877 smoke was seen ascending from the sea surface over the shoals. In October, 1885, an island had been formed 2 miles long and 200 feet high. At this time a terrific eruption was in progress, enormous clouds of constantly changing form rising over the island. The shocks of the explosion were felt on neighboring islands and the sound was heard 200 miles away. As the island consisted chiefly of ashes, it has since then been rapidly consumed by the waves, and will soon disappear unless new eruptions occur."

Volcanoes

**Volcanoes, Active and Extinct.** The terrible holocaust which devastated the islands of St. Vincent and Martinique takes rank in its appalling significance with the most frightful disasters of history. There was time to escape from Herculaneum and Pompeii, but never so far as known has an entire community been wiped out of existence on the instant in the manner illustrated at the Southern islands of Great Britain and France. Anyone who has studied the sun spots and noted the vast outward rushes of fiery gas or material from the surface of the sun, projected thousands of miles into space, can imagine that at St. Pierre something of the kind, on an infinitesimal scale, had happened. The fact that the volcano of Pelée had been "dead" for 50 years shows that there is an element of uncertainty about these splendid monuments to the hidden powers of the earth, and suggests that those who insist on living on the slopes of other "dead" or sleeping volcanoes, as Vesuvius, are acting with open eyes and taking the chance of death.

The United States, or that portion included in the continent proper, is comparatively free from such menaces to human life, yet there are many localities which show that the volcano has been in the past an active factor in the country. In New Mexico the traveler passes a number of old volcano cones, and miles of the country are covered with lava which ran in a fiery flood over the valleys, devastating the land. This is pointed out as the flow of an extinct volcano, and there is no legend or history to tell when it occurred. As a matter of convenience, an extinct volcano is one which has not displayed any activity for 100 years, but this is no guarantee that it is not liable to reawaken. The people who died at Herculaneum had been taught to believe that Vesuvius was an extinct volcano.

Volumes have been written about volcanoes and their causes, but in point of fact, very little is known about them beyond what we see. In the 18th century Humboldt tells us "225 volcanoes erupted," and this is known to be far below the actual number; doubtless the "extinct" volcano is merely dormant. Etna, which towers 11,000 feet into the air and has a circumference of about 100 miles, has been active periodically for thousands of years — 3,000 at least. For the past 2,000 years it has had eruptions about four times a century, or every 25 years. Etna is a typical periodic volcano, while Stromboli is an example of continued mild eruptions. The photographs of the moon exhibit a remarkable state of ancient volcanic eruption, the face of the moon having the appearance of a pepper box, and doubtless from a great height the earth or certain sections would

have a similar appearance, as volcanoes, ancient and modern, are more common than is generally supposed. The Pacific Ocean, especially in the equatorial region, is dotted with them. The following groups are conspicuous volcanic centers: the Society group, Marquesas, Navigator, Fiji, Friendly Islands, New Hebrides and Ladrones. Many of these are active, as Tauna and Ambrym in the New Hebrides, Tafoa and Amargura in the Friendly Islands, and Tinakora in the Santa Cruz Islands. Mauna Loa, 13,760 feet high, is one of the splendid active volcanoes of the world, as well as Mt. Hualalai, 10,000 feet, while Mount Kea also on the Hawaiian Islands, is now supposed to be extinct. At least 10 of the islands, including Martinique, representing the West India group, are volcanic and bear volcanoes. In the Mediterranean country we have Vesuvius, the volcanoes of Sicily and others in Spain, France, Germany, etc., formerly more or less active. Near Greece there are five volcanic islands. Mt. Ararat, 16,950 feet, is an ancient volcano, and along the Red Sea are many volcanic cones. Passing on to Java we find 50 volcanoes, 25 of which are active, and the same is true more or less, of Sumatra and Borneo. About the latter over 100 make life strenuous among the small islands. Madagascar, Mauritius, the Isle of Bourbon, and Comoro Islands, all have volcanoes, and as we approach the South Pole the smoke of Erebus and Terror suggests volcanic activity. Africa is not particularly famous in this respect, but the Bight of Benin and the various islands are volcanic. St. Helena, the Canaries, the Cape Verde, Madeira, Iceland and the Azores are virtual volcanoes more or less ancient.

With the Philippines we have acquired 15 or 20 volcanoes. Patagonia has its volcanoes; Chili can boast of 32, Aconcagua being 23,000 feet in height, and there are a dozen in Peru and Bolivia. Quito is surrounded by nearly 20 volcanoes, none of which is under 12,000 feet, Cotopaxi (19,660 feet) being the center of interest. Coming up the coast the volcano seeker will find nearly 40 in Central America, and in Mexico a number, large and small.

The volcanoes of America, or of the United States, are of especial interest and are found in the Western country, as a rule W. of the Rocky mountains. One of the most beautiful of these is Mt. Shasta, 14,440 feet high, which rears its massive twin cones in Northern California. Mt. Helena in Oregon, 12,600 feet in height, is a majestic volcanic peak, and Mt. Hood, 11,225 feet, has a world-wide fame for its beauties, little thought being given to its activity in the early geological history of the continent. Other famous peaks are Mt. Jefferson, Mt. Adams, Mt. Rainier, Mt. Baker and Mt. Lassen.

In the Aleutian chain there are 21 islands with volcanoes. Kamtchatka has 15 or 20, the Kurile Islands 13, and the Japan group 24. In a word, the world is fairly dotted with volcanoes notable for their activity. The catastrophe of Mt. Pelée calls to mind other famous eruptions. The extinct volcano of Maui, 10,217 feet high, not many centuries ago emitted a river of lava 2 miles wide. In 1779 Vesuvius tossed cinders 10,000 feet into the air. During the time of Christ, Vesuvius was extinct; even its crater was covered with verdure and its slopes to the summit with vines and trees; then Pompeii was destroyed and 1,000 years passed in silence till 1036, when an eruption occurred. In 1631 towns about the base were destroyed, and it is known that the outbreaks have increased in volume and violence in time; yet people still live on the slopes, inviting the fate which is almost certain to come in some later generation.

In 1815 Tomboro on the islands of Sumbawa erupted, causing a panic in the Javanese group. Herschel estimated that the ashes if collected would have made a solid mass three times the size of Mont Blanc. For days utter darkness hung over the island and explosions were heard in Ceylon, nearly 1,000 miles distant. In 1783 Mt. Reykjanes threw out a mass of lava equivalent to 21 cubic miles. Perhaps the most remarkable flow was that of Kilauea, one of our own possessions, which in 1840 ejected a river of lava 40 miles long; if collected it was estimated that it would have covered a square mile 800 feet in depth. The roar of the volcano of Cosequina, Nicaragua, in 1835, was heard at Jamaica, 800 miles N. E. That of St. Vincent in 1812 was heard on the llanos of Caracas. The volcano of Soufrière at St. Vincent, now devastating the island and supposed for years to be extinct, has many times wrecked portions of the island, the eruptions of 1718 and 1812 being particularly terrible. The latter has been remembered as "Black Sunday." The inhabitants of Barbadoes thought that the fleets of France and Germany were engaged, so loud was the continued roar, yet Barbadoes is 80 miles distant. This island was buried deep in gloom from the dust of St. Vincent and covered several inches deep, yet the St. Vincent islanders forgot the warning, and on the termination of the present outbreaks on this island and Martinique, the places not covered with lava will again be occupied, St. Pierre will be restored, and life, or what there is left, will move on till the next cataclysm. CHARLES F. HOLDER.

**Vole,** the *Arvicola,* a genus of rodents typical of the subfamily *Arvicolinæ,* which also includes the lemmings (*Mylodes*), the musk rats (*Fiber*), and several related genera. The genus *Arvicola* includes over

40 species distributed over Europe, Asia, and North America — all more or less like rats and mice.

**Voleslav, Jablonsky.** See TUPY, EUGENE.

**Volga,** the largest river of Europe; rises in the Central Russian province of Tver, near the Dwina, about 200 miles from the Gulf of Finland; flows S. E. through several small lakes, receiving the Selicharovka from Lake Seliger, then S. E. past Rsjev to Subzov, where it turnes N. E., passing Tver and Rybinsk, then S. E. through the provinces of Jaroslav, Kostroma, Nijni Novgorod, and Kasan, passing Nijni Novgorod and Kasan, and receiving from the right the Oka, and from the left the Mologa, Kostroma, Unsha, and Wetluga. At Kasan it turns S., receives from the left the great Kama and the Samara, and from the right the Sura, separates the provinces of Simbirsk, Saratov, Samara, and passes the towns of Simbirsk, Samara, Sysran, Wolsk, and Saratov. At Sarepta it turns sharply to the S. E. and flows in that direction to the Caspian, which it enters by 8 principal and 200 smaller mouths, forming a delta 68 miles in breadth. Beside those named, about 100 smaller tributaries join this giant river, which with its affluents has a drainage area of 592,300 square miles, waters 22 provinces, and measures from its source to its mouth 2,400 miles. Its breadth at Tver is 705 feet, at the mouth of the Mologa 1,542 feet, above the influx of Kama 4,920 feet and opposite the mouth of the Kama nearly 5 miles. The course of the Volga is very slow, its total fall is only 896 feet, and its channel is comparatively shallow, its greatest depth being 85 feet. The Volga is free from ice for 200 days in the year, in Kostroma, Jaroslav, and Kasan for 152. Steamers ply regularly on its waters between Tver and Nijni Novgorod, Kasan, and Astrakhan; and from Nijni Novgorod by the Kama to Perm, by the Oka to Riazan, by the Ufa to Ufa, and by the Unsha to Ugor. The three great canal systems of Vishni-Volotchok, Tichvin, and the Marien canal, connecting the Volga with St. Petersburg, and the canal of the Duke of Wurtemberg joining it with the Dwina, make an unbroken water way between the Baltic and the Caspian Sea. A canal to join the Volga with the Don, between Zarizyn at Katchalinsk, was projected by Peter the Great, but was never executed. Its purpose is now effected by the Zarizyn-Kalatsch railway. The Volga has extensive fisheries, chiefly of salmon and sturgeon.

**Volhynia,** a province in Western Russia, bounded on the W. by the Polish provinces, from which it is separated by the Bug river. The surface in the N. of the province is low, and plains and morasses, covered with forests, abound; in the S. there are hills and fertile, corn-bearing land. Among the rarer mineral products are lithographing stone and porcelain clay. The area (27,743 square miles) is larger than that of Greece; pop. (1909) 3,691,000. The capital is Zhitomir. Pop. (1900) 80,787.

**Volkelt, Johannes Immanuel** (folk'-elt), a German philosopher; born in Lipnik, Galicia, Austria, July 21, 1848. He was made Professor of Philosophy in the University of Basle, 1883, and in that of Leipsic, 1894. In his studies he has sought to reconcile the contradiction between the ancient and the modern schools of philosophy in their respective theories of the universe. His chief writings are: "The Unknown and Pessimism" (1873); "Immanuel Kant's Theory of Cognition Analyzed in its Fundamental Principles" (1879); "Experience and Thought" (1886); "Æsthetic Questions of the Times" (1895).

**Volkmann, Alfred Wilhelm** (folk'män), a German physiologist; born in Leipsic, Germany, June 1, 1801. He was Professor of Physiology in Halle and made special studies of the nervous system and the sense of sight. Among his works are: "Anatomy of Animals, Illustrated with Plates" (1831–1833); "Contributions to the Physiology of the Sense of Sight" (1836); "The Independence of the Sympathetic System of Nerves" (1842); "Dynamics of the Blood" (1850); "Physiological Researches in the Department of Optics" (1863–1864); "Elasticity of Muscles" (1856). He died in Halle, Germany, April 21, 1877.

**Volkmann, Richard von** (RICHARD LEANDER), a German surgeon; born in Leipsic, Germany, Aug. 17, 1830. He was Professor of Surgery in the University of Jena. Among his professional writings are: "Diseases of the Motor Organs" (1865); "Manual of Surgery" (1865); "Contributions to Surgery" (1875). He wrote also: "Reveries at French Firesides," a series of tales (1871; 22d ed. 1894); "From Student Times" (1876); "Poems" (3d ed. 1885); "Short Poems" (2d ed. 1889); "Old and New Troubadour Songs" (2d ed. 1890). He died in Jena, Germany, Nov. 28, 1889.

**Volkmar, Gustav** (folk'mär), a German theological writer; born in Hersfeld, Hesse, Germany, Jan. 11, 1809. He was Professor of Theology in the University of Zürich. His principal works are: an edition of "The Gospel of Marcion" (1852); "Justin Martyr and his Relation to our Gospels" (1853); "Sources of the History of Heresies down to the Nicene Council," vol. i., "Hippolytus and the Philosophumena" (1853); "Religion of Jesus and its First Development" (1857); "Origin of our Gospels" (1866); "Life and Works of Zwingli" (1870); "Myths of the Popes" (1873); "The Synoptics and the Historical Facts of the Life of Jesus" (1877); "Jesus

of Nazareth and the Early Christian Times" (1882); "Paul from Damascus to the Epistle to the Galatians" (1887). He died in Zurich, Switzerland, Jan. 10, 1893.

**Vollmar, Georg von** (fōl'mar), a German socialist; born in Munich, Bavaria, March 7, 1850. He wrote: "The Isolated Socialist State" (1880); "The Next Task of the Social Democracy" (1891); "On State Socialism" (1892).

**Vollmöller, Karl Gustav** (fōl'muhl-er), a German philologist; born in Ilsfeld, Würtemberg, Germany, Oct. 16, 1848. He was appointed Professor of Romanic and English Philology in the University of Göttingen, 1881. He wrote: "Kürenberg and the Nibelungen" (1874); "Munich's Brutus" (1877); "Poem of the Cid" (1879); "Octavianus" (1883); "Monuments of the English Language and Literature from the 16th to the 18th Century" (1883). He edited the "Critical Annual of the Progress of Romanic Philology" (commenced in 1892).

**Volney, Constantin de, Count** (volnā'); family name CHASSEBŒUF (shasbuhf), a French philosopher and traveler; born in Craon, France, Feb. 3, 1757. He published in 1789 his "Travels in Egypt and Syria" (2 vols.), the best description of them to that date. In 1789 he was elected a deputy to the States-General. In 1791 he produced a work on which his fame principally rests — "Ruins; or, Meditations on the Revolutions of Empires." Imprisoned in 1793, on his release he passed two years in the United States, publishing in 1803 his "Description of the Climate and Soil" of the country. Among his other works are: "The Natural Law; or, Physical Principles of Morality" (1793); and "Researches in Ancient History" (3 vols. 1814). He died in Paris, April 25, 1820.

**Vologda,** a province of Russia, S. of Archangel and N. of Kostroma; area, 155,498 square miles. Its surface is mostly a vast plain, becoming hilly toward the S.; and mountainous toward the E., where the Urals expand into a wild highland tract. Only in the S. of the province is agriculture possible. Most of the province lies in the great forest zone, and 87 per cent. of its surface is covered with pine woods. Vologda is drained chiefly by the Dwina and its tributaries toward the White Sea; the Petchora flows through the N. E. part to the Arctic Ocean. Hunting and fishing are almost the only employments in the major portion of this province. Salt, skins, and iron are exported. Pop. (1909) 1,565,800.

VOLOGDA, the capital of the province, on the Vologda, a tributary of the Suchona; 281¼ miles N. of Moscow, is an old wide town, largely built of wood, the residence of the governor and a bishop. It has 54 churches, a theological seminary, a gymnasium, and several monasteries. There are extensive manufactures of sailcloth, leather, soap, matches, linen cloth, glass, white lead, and jewelry. Vologda was founded in the 12th century. During the 16th it was a great center of trade with England, and many English settled here. Though less important now as a trade emporium, much merchandise still passes through the place to the White Sea ports. Pop. (1909) 27,705.

**Volsci,** a people of ancient Latium, whose language proves them to have been a branch of the Umbro-Sabellian stem, and who, holding the Pontine Marshes, the valley of the Liris, and the Volscian Hills, extended from the seacoast to the Samnite frontier. With Rome they seem from an early period to have waged constant wars, with one of which the legend of Coriolanus is associated, but Rome had entirely subdued them by 338 B. C., from which date they vanish as a separate race from history.

**Volsk,** or **Voljsk,** a town of Russia, province of Saratov; on the Volga; 80 miles N. E. of Saratov. It has 5 churches, a technical school, normal school, etc. There are large quays along the river, and trade in tallow and skins with St. Petersburg, in fruit with Nijni Novgorod, and in corn with Astrakhan and Rybinsk, is carried on. A great market is held in autumn. Pop. (1890) 39,995.

**Volsungs,** a famous heroic race in old German legend, its founder Volsung or Walsung, the grandson of Odin, and its brightest ornament Volsung's son, Siegmund. Sigfried or Sigurd, hero of the "Nibelungenlied," is of the same stock. The tale is enshrined in the Old Icelandic Volsungasaga, which has been followed by William Morris in his "Story of Sigurd the Volsung."

**Volt** (named in honor of Alessandro Volta), in electricity, the unit which expresses difference of potential. An electrical current is in many respects analogous to a flow of water. The fundamental unit is one of mère quantity, the coulomb, and merely expresses sufficient current to do a certain amount of work. But the same quantity of water would flow through a large pipe at one inch per second, and through one-half the diameter at four inches per second. Hence we get the unit expressing quantity per second (the ampère); and thirdly, as a greater pressure or force is required to drive water at a given rate per second through a small pipe, or greater resistance so as to maintain a given quantity per second, in electrical currents we have this force or pressure, considered as the difference of potential or electrical pressure at the two ends of the circuit of wire. The

resistance of a wire to the passage of a circuit is measured in ohms (units), and a volt is the difference of potential required to drive an effective current of one ampère through a wire interposing the resistance of one ohm.

**Volta,** a river of Upper Guinea, West Africa; which, rising in the Kong Mountains or highlands behind the Ashanti country, runs S. between Ashanti and Dahomey, and reaches the Bight of Benin through the E. part of the British Gold Coast. To left and right of its mouth it forms great lagoons, and on the bar across the mouth a heavy surf runs.

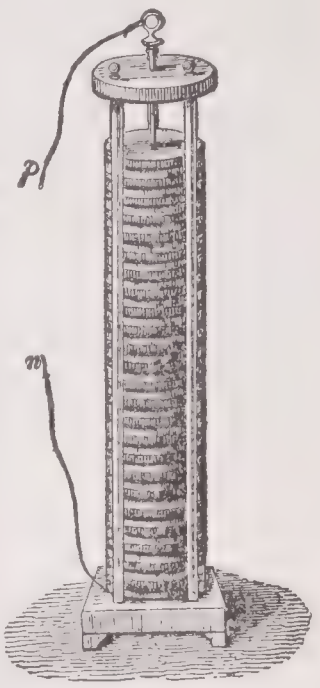
**Volta, Count Alessandro,** an Italian natural philosopher; born in Como, Italy, Feb. 18, 1745. Two treatises, published in 1769 and 1771, in which he gave a description of a new electrical machine, laid the foundation of his fame. He was successively Professor of Physics at the gymnasium in Como and in the University of Pavia. He invented the electrophorus, electroscope, electrical condenser, electrical pistol, and the voltaic battery in the form known as "crown of cups."

COUNT ALESSANDRO VOLTA.

He also devised several other electrical appliances, and in 1800 the voltaic pile. To him is due the theory that electricity is generated by the contact of dissimilar metals, a correction of Galvani's animal electricity theory. In 1782 he made a tour through France, Germany, England, and Holland. In 1801 Napoleon invited him to France, where a medal was struck in his honor. In 1810 he was created a senator of Italy, with the title of count; and in 1815 was made director of the philosophical faculty of Padua. Volta's name is perpetuated in a large number of electrical terms. He died in Como, March 5, 1827.

**Voltaic Battery,** a term sometimes applied to a VOLTAIC PILE (*q. v.*), but more specifically used for a battery of several voltaic cells; known also as a galvanic battery (from Galvani), though the honor properly belongs to Volta. See ELECTRICITY: VOLTA.

**Voltaic Pile,** Volta's arrangement for producing a current of electricity, consisting of a pile of alternate disks of two dissimilar metals, as copper and zinc, zinc and silver, zinc and platinum, separated by pieces of flannel or pasteboard moistened with salt water or with water acidulated with sulphuric acid.




VOLTAIC PILE.

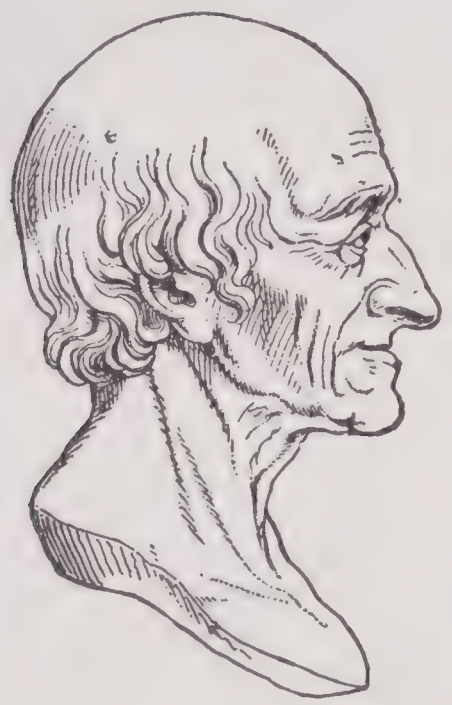
**Voltaism,** in physics, a term applied to galvanism, from the fact that Volta's explanations of Galvani's experiments on frogs led to the correct appreciation of the sources of the electricity so generated.

**Voltaire,** the assumed name of FRANÇOIS MARIE AROUET, a French poet, historian, and philosopher; born in Châtenay, near Paris, in 1694. He was educated by the Jesuits at the College of Louis le Grand, and already showed so clearly the characteristics which marked him through life, that one of his teachers foretold his eminence as the "Coryphée du Déisme." He was early introduced at the *salon* of Ninon de l'Enclos, and became familiar with some of the most distinguished persons of the time. Ninon, pleased with his remarkable intelligence and liveliness, left him a legacy of 2,000 francs, to buy books. His father's ambition was that he should become, not author, but lawyer and judge; and to break off his associations in Paris, sent him away in 1713, as page to the Marquis de Châteauneuf, ambassador to Holland. He was soon sent home, however, after getting into trouble about a love affair, and was next placed with a lawyer. Quickly and finally escaping this attempt to tame and train him for official life, he soon appeared in Paris again, and from that time he pursued his course as a literary man.

In 1716 he was committed to the Bastille, on suspicion of being the author of a satirical poem on Louis XIV., and remained there a year. His first literary work of mark was the tragedy of "Œdipe," which, with much difficulty, he got represented in 1718. During a visit to Brussels in 1721, he was introduced to Rousseau, but this interview made enemies of them forever. He was sent to the Bastille a second time, in consequence of a quarrel at the Duke de Sully's house, and after his release, spent three years in England, where the prevalence of

free-thinking made an atmosphere congenial to him. Here, in 1728, he published his celebrated epic poem, "La Henriade," under the title of "La Ligue," and applied himself to other literary labors. He rose speedily to the summit of renown as an epic poet; was courted in all the higher circles; and when he returned to France, he found himself a sort of national idol among the French. After the publication of several plays, he retired, about 1735, to Château de Cirey, near Vassy, in Champagne, belonging to the Marchioness du Châtelet, a lady celebrated for her love of mathematics and abstruse sciences, and who read Leibnitz and Newton in the original Latin.

During the several years of his residence with Mme. du Châtelet, a connection which Lord Brougham defends as entirely Platonic,



VOLTAIRE

he wrote, between other works, his "Elements of the Philosophy of Newton," in which he explained the theories of the great discoverer with clearness, elegance, and learning, though perhaps not always with accuracy. A new epoch opened in his life, when, in 1736, he was flattered by a letter from Frederick, Prince-royal of Prussia, afterward Frederick the Great. These two remarkable men first met after the accession of Frederick to the throne in 1740. The meeting was at a château near Cleves, and a second took place soon after at Berlin. The first Silesian war separated them, and Voltaire returned to Holland. They continued, however, to correspond. For a while, in 1746, Voltaire removed to Paris, where he received the appointment of historiographer of France, and gentleman of the king's bed chamber. He was at the same time received at the Academy. Soon losing favor at the court, he accepted, in 1750, the often renewed invitation of Frederick II. to settle at his court. Frederick

Voltaire

received him with transports of joy. He was lodged in the apartments of the Marshal de Saxe; the king's cooks, servants, and horses were placed at his disposal; he was granted a pension of $4,000; and he and the king studied together for two hours a day, while he was welcomed to the king's table in the evening. At first the connection seemed a charming one, but Voltaire soon learned by demonstration, not only that courts are wearisome places, but that Frederick of Prussia and François Arouet were too much like each other to become real friends. Their intimacy, chiefly fruitful in jealousies, dissensions, and all kinds of uneasiness, ended after three years by the flight of Voltaire. At Frankfort he was joined by his niece, Mme. Denis; and at the same city he was arrested by the Prussian resident, and detained till a volume of Frederick's poems was given up. After a short stay at Colmar, and some trouble about his "Essay on Morals" he settled with Madame Denis at Ferney, then a mere hamlet, near the Genevese territory. There he passed the last 20 years of his life, unwearied in writing, and at the same time active in promoting the interests of the little village, which, under his fostering care, grew up into a neat little town, and became the seat of a flourishing colony of watchmakers.

As the home of Voltaire, Ferney became a center of attraction for the most distinguished persons of all countries. Voltaire carried on correspondence with Frederick the Great and Catherine II. of Russia; pleaded eloquently and successfully for the Calas family; educated the grand-niece of Corneille, and gave her a marriage portion; and offered Rousseau an asylum. His books and his speculation in the funds had made him enormously rich, but he spent nobly his fortune, and the fugitives from the civil troubles of Geneva and other towns always found an asylum beneath his roof. At the age of 84, yielding to the importunity of his niece, he once more visited Paris, where he brought out a new tragedy, "Irene." His whole journey and his reception there was one continuous splendid triumph. He was everywhere attended by crowds; occupied the director's seat at the Academy, was crowned at the theater; and then, exhausted by the excitement and loss of sleep, took opiates, and, after great suffering, fell into a lethargy, and so died, May 30, 1778. Among his latest words were these: "I die worshiping God, loving my friends, not hating my enemies, but detesting superstition." The curé of St. Sulspice refused the rites of burial, and the body of the "great mocker" was interred by night in the abbey of Sullières, whence it was removed at the Revolution, and deposited in the Pantheon. The works of Voltaire in the most complete editions,

fill 70 volumes, 8vo. In addition to those already named, are the plays, "Zaïre," "Mahomet," "Merope," and "Oreste"; the too celebrated poem "La Pucelle"; the "Story of Charles XII."; the "Century of Louis XIV."; the "Essay upon the Morals and Wit of Nations"; the satirical novel, "Candide, the Optimist"; and the "Dictionary of Philosophy."

**Voltameter,** in electricity, an instrument for measuring the work, and thus indirectly the strength of a voltaic current. This is done by the amount of electrochemical decomposition, a certain current reducing a certain amount of hydrogen from water, silver or copper from their salts, etc. This must not be confounded with voltmeter.

**Volterra,** a town of Italy, province of Pisa; 5 miles from Saline, which is 48½ miles S. E. of Leghorn. It is surrounded by ancient walls with great gates, the chief of which is the Porta all'Arca. The cathedral, opened in 1120, contains fine marble sculptures; the baptistry of St. Giovanni and the church of St. Francesco have valuable frescoes and other paintings. The citadel, founded in 1343, with a more modern addition called Il Masteo, was long used as a penitentiary. In the Palazzo Communale is the Museo Civico, founded in 1208, and containing a valuable collection of Etruscan antiquities and a library. Volterra has also remains of baths and an amphitheater. Large alabaster works are the main industry of the town. At Saline are important salt works and borax springs, Near Volterra are also several Etruscan burying places and a subterranean labyrinth. The ancient Volaterræ (Etruscan Velathræ), Volterra, was one of the 12 great Etruscan cities. The Romans took it in 474 B. C., and it became an important municipium, resisting a siege by Sulla for two years. Pop. about 5,500.

**Volterra, Daniele da.** See RICCIARELLI, DANIELE.

**Voltmeter,** in electricity, any instrument for measuring the pressure, electromotive force, or difference of potentials at the ends of an electric current. The gold-leaf electroscope is a kind of voltmeter, but will only measure large differences of potential. If the terminals are connected with flat plates arranged parallel to each other, one of which is movable, the attractive force between the plates at a given small distance will be a voltmeter. This method is too coarse for ordinary currents, but a modification of it is employed in Thomson's quadrant electrometer. In Cardew's voltmeter the heating effect of the current in a wire, which varies with the electromotive force, and is measured by the expansion produced, is employed. In the majority of instruments the electro-magnetic action is employed in some form of galvanometer. These are more usually wound to act as ammeters, but if wound with very thin wire the high resistance allows the electromotive force required to drive a certain current through them to be calibrated and denoted in volts. Such instruments are adjusted or calibrated by comparison with a "standard" voltaic cell or voltameter.

**Volturno,** a river of Italy, rising in the province of Campobasso; flows S. E. to its junction with the Calore, and then W. past Capua into the Mediterranean, 20 miles S. E. of Gaeta; course, 90 miles.

**Voltzia,** in palæobotany, a genus of *Coniferæ*, consisting of lofty trees with pinnated branches, having on all sides sessile leaves, in form and imbrication like those of araucaria. It has also affinities to the cypress. Found in the Permian and the Trias of Great Britain and Germany.

**Voltzine,** or **Voltzite** (after the French mining engineer Voltz), a mineral occurring in mammillary groups of globules, having a concentric lamellar structure, optically uniaxial; hardness, 4–4.5; sp. gr. 3.66–3.81; luster, greasy, sometimes pearly on a cleavage surface; color, yellowish, brownish. Composition: An oxysulphide of zinc, with the formula $4ZnS + ZnO$, which represents: Sulphide of zinc, 82.73; protoxide of zinc, $17.27 = 100$.

**Volume,** the space occupied by a body; dimensions in length, breadth, and depth; compass, mass, bulk. In chemistry, the volume of an irregular body may be found from its weight and specific gravity; that is to say, the weight of a unit volume. If $w$ be the weight of the body in grammes, and $s$ its specific gravity, the fraction $\frac{w}{s}$ gives its volume in cubic centimeters. The capacities of vessels are determined by filling them with water or mercury from a measuring tube, or other vessel whose capacity is previously known; or, when very great accuracy is required by determining the weight of water or mercury, at the standard temperature, which fills the vessel. In music, a term applied to the power and quality of the tone of a voice or instrument, or of a combination of sounds. In physics, the volume of a body may be real or apparent; the former is the portion of space actually occupied by the matter of which the body is composed, the latter is the sum of its real volume and the total volume of its pores. The real volume is invariable, the apparent volume can be altered in various ways; for instance, it diminishes as a rule on the solidification of the body. A unit of volume is the volume of the cube constructed on the unit of length.

**Volumenometer,** or **Volumometer,** an instrument for measuring the volume of a solid body by the quantity of a liquid or of the air which it displaces, and thence also for determining its specific gravity. A very simple volumenometer consists of a globular flask with a narrow neck, about 12 inches long, and graduated from below upward to indicate grains of water. The flask has a tubulure, accurately fitted with a ground stopper for admitting the solid body to be measured. The instrument being filled to the mark 0° on the neck with a liquid, as water, which does not act upon the solid, it is inclined on one side, the stopper removed, and the solid body introduced. The stopper is then replaced, and the number of divisions through which the liquid is raised in the stem gives at once the volume of the body in grain measures.

**Volumetric Analysis,** a method of quantitative chemical analysis in which the balance and other elaborate apparatus are more or less dispensed with; a few glass vessels, some graduated, being alone necessary. It consists in ascertaining how much of a solution of definite strength and properties must be added to a solution of unknown strength before a given effect, indicative of the termination of a chemical reaction, can be produced. Many solutions of unknown strength can thus have quantitative values rapidly given to them.

**Voluntary Controversy,** in Church history, a controversy which arose in Scotland in 1831 with regard to the mutual relations which should subsist between the civil government and the Church. About the year 1780 a member of the Burgher denomination published a pamphlet, in which he advocated what is now called Voluntaryism, and in May, 1795, proposed a modification of the Confession of Faith in conformity with the new views. The synod ultimately granted the prayer of the petition, a minority withdrawing in 1799 and becoming known as the Old Light Burghers. The same change of views appeared with similar results somewhat later among the Antiburghers. In May, 1804, they superseded their "Act and Testimony," which was in favor of Establishments, by the "Narrative and Testimony," the acceptance of which they made a condition of communion. Four ministers withdrawing in 1806, formed themselves into the Constitutional Associate Presbytery. The two denominations, which had at one point modified their creed, joining in 1820, became the United Secession. Up to this time, and for some years subsequently, the Voluntary Controversy had attracted little notice, but in 1831 it began to excite great attention throughout Scotland, the leading ministers of the Established Church on the one hand, and those of the United Secession on the other, carrying it on with the greatest ardor. The controversy had far-reaching consequences. To a certain extent it was to strengthen the Established Presbyterian Church on points on which its "voluntary" assailants had declared it weak that Dr. Chalmers proposed the VETO ACT (*q. v.*), with the unexpected result of ultimately producing the Disruption. In the contest on the part of English Nonconformists for "religious equality" they maintain essentially the same views as the Scottish United Secessionists did in the Voluntary Controversy. See BURGHER.

**Voluntary Jurisdiction,** in law, a jurisdiction exercised in matters admitting of no opposition or question, and therefore cognizable by any judge, in any place, on any lawful day.

**Voluntary Muscles,** muscles excited by the stimulus of the will or volition acting on them through the nerves, though some of them habitually, and all of them occasionally, act also under the influence of other stimuli. They are the muscles of locomotion, respiration, expression, and some others.

**Volunteers,** citizens who of their own accord offer the State their services in a military capacity without the stipulation of a substantial reward, and without being attached to the regular army. The oldest volunteer force in Great Britain is the Honorable Artillery Company of the city of London, which received its charter of incorporation from Henry VIII. In 1794, and again in 1803, when the ambition and threats of France agitated England, the government reckoned on having nearly 500,000 efficient volunteers in arms. The numbers soon declined, and in 1815 the force almost ceased to exist. About 1857 a feeling of insecurity began to manifest itself in consequence of the alleged insufficiency of the national defenses, and the Victoria Rifles and one or two other corps were formed. In the course of two or three years many thousands of volunteer riflemen were enrolled throughout the kingdom. Acts of Parliament relating to the force were passed in 1863, and 1869, and these with the Regulation of the Forces Act of 1871, the Volunteer Act of 1896, and orders in council issued from time to time, constitute the law relating to volunteers. There are now also corps of artillerymen, engineers, light horse, and mounted rifles as part of the volunteer force. In connection with the volunteer movement a National Rifle Association was formed in 1860, which inaugurated those great annual meetings held till 1889 at Wimbleton (since removed to Bisley, near Woking), where many thousands annually compete for prizes. This was followed by a National Artillery Association,

whose annual meetings are held at Shoeburyness.

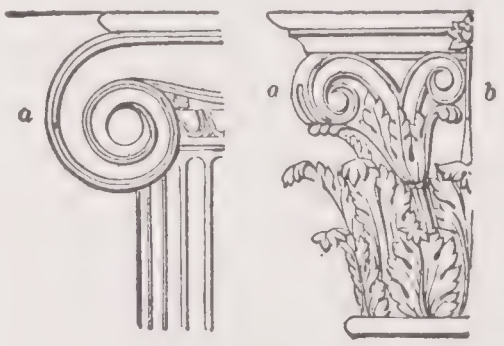
In case of a war of magnitude the United States has always relied on its volunteer soldiery. During the Civil War, including reënlistments, there were 2,656,533 men in the field — the great body of whom were volunteers. They were paid by the National government, but the States appointed field and line officers.

**Volunteers of America,** a religious body; organized from former members of the Salvation Army in March, 1896, by Commander and Mrs. Ballington Booth and consisting of six regiments, embracing nine companies or central societies and nearly 100 self-supporting posts, not including outposts. The head officer is elected by the members as commander-in-chief, and by the directors as president. There are four branches of philanthropic work: (1) The sociological branch, which provides homes for destitute men. In 1901 the eight homes located in various cities furnished lodging for 200,000 persons. (2) The Home of Mercy, branch for friendless young women maintaining one home in Newark, N. J., and one in Boston, Mass. (3) The tenement work for the worthy poor. (4) The philanthropic branch, working among unprotected children. The Prison League is an important department of volunteer activity. In 1901 there were branches in 13 States, embracing 7,500 prisoners and corresponding with 19,000 men. The two homes for the reception of discharged prisoners are known as Hope Halls. One is located in Chicago and another in Flushing, L. I. A large majority of the ex-convicts who have been sheltered by these homes and provided with situations have made good records for themselves. The nine central societies or companies raised during 1900, over $80,000 for the pay of their officers and the carrying on of the work. There was an aggregate attendance of 1,113,683 persons at the hall meetings and 1,733,637 at the open air meetings.

**Volusenus, Florentius** (Florence Wilson, or Wolsey), a Scottish humanist; born near Elgin at the opening of the 16th century. Having received his early education in Scotland (probably at Aberdeen), he seems to have proceeded to the University of Paris. Like his contemporary and personal friend George Buchanan, he cultivated classical learning in preference to the logic and philosophy of the schoolmen, and attained a mastery of Latin which gives him a place with the first scholars of his time. After acting as tutor to a son (spoken of as a nephew) of Cardinal Wolsey, he eventually became principal of a school at Carpentras, near Avignon, a position he owed to the favor of Cardinal Sadoleto. In 1546, on his way home to Scotland, Volusenus died at Vienne in Dauphiné, lamented by Buchanan in a Latin quatrain, which proves the strength of their friendship. His chief work is his "The Tranquillity of Mind," written in the purest classical Latin, every page of which reveals the essential refinement and moral beauty of his nature.

**Voluta,** a genus of gasteropodous mollusca, the type of the family *Volutidæ*, having a turreted or convoluted shell, the shell aperture being notched in front. There is no speculum, and the foot is large and well developed. To this family also belongs the genus *Mitra*. In the genus voluta itself the spine of the shell is shut, and the columella or central pillar or axis of the shell is plaited. In the allied genus *Mitra* the mouth to the shell is small, and the shell itself spindle-shaped. Many species of both genera occur in modern seas: the genus voluta first occurs in the Chalk in a fossil state.

**Volute,** in architecture, a kind of spiral scroll used in Ionic, Corinthian, and Composite capitals, of which it is a principal




VOLUTES OF THE IONIC AND CORINTHIAN CAPITALS.

a, volutes; b, helix.

ornament. The number of volutes in the Ionic order is four. In the Corinthian and Composite orders they are more numerous, in the former being accompanied by smaller ones, called helices; called also voluta. In zoölogy, any individual of the genus *Voluta*.

**Volute Wheel,** a volute-shaped shell, that in revolving presents its open mouth to the air, which is thus gathered into the tube and discharged through the hollow axis. It is a common and effective sort of blower. Also, a water-wheel with radial or curved buckets, in which the periphery of the wheel is surrounded by a volute-shaped casing or scroll, which confines the water against the wheel.

**Volvocineæ,** in botany, a family of *Confervaceæ*, placed by Ehrenberg under his Infusoria, but which Siebold, Williamson, Busk, and Cohn have shown to be confervoid *Algæ*. Nearly microscopic plants, composed of many zoöspore-like bodies associ-

ated into spherical or quadrangular colonies, the separate members of which, connected or held together in various ways by cell membranes, retain their distinct individuality for all purposes of nutrition, growth, and reproduction. They are inhabitants of fresh-water ponds, in which the whole colony is carried in a circular and progressive movement by the vibratile motion of the cilia, which project from the separate individuals through the jelly into the water. They exhibit in their maturity the characters of the transitory zoöspores of other confervoids.

**Volvox,** in botany, the typical genus of *Volvocineæ*, with one species, *V. globator*. To the naked eye it resembles a minute pale green globule floating about in the water. Under the microscope it is seen to be a spherical membranous sac, studded with innumerable green points, really apertures giving exit to cilia, which enable it to roll over and over in the water. Within the sac are various dense globules, generally green in summer, but often of an orange color in autumn and early winter. They are zoöspore-like bodies, each sending a pair of cilia through separate orifices. There is a reddish brown spot and a contractile vacuole. They are found abundantly in clear pools on open commons and similar localities.

**Vomer,** in anatomy, a small thin bone in the median line, forming the posterior and principal portion of the partition between the nostrils in man. It exhibits many modifications in the different classes of vertebrata. In fishes an important character is the presence or absence of teeth on the vomer (that is, along the middle line of the roof of the mouth). The bone is so named from the fact that in man it bears some resemblance to a plowshare. In palæontology, a genus of *Carangidæ*, allied to *Caranx*, from the Chalk of Comen in Istria.

**Vomica,** small tumors in the lungs, which eventually suppurate, burst, and degenerate into abscesses, discharging, by cough and expectoration, a discolored pus, of different consistencies, and sometimes marked with blood. When there are many such abscesses, the case is called one of suppurating phthsis. See CONSUMPTION: TUBERCULOSIS.

**Vomiting.** See DIGESTION.

**Von Arnim.** See ARNIM.

**Vondel, Joost van den** (von'del), a Dutch dramatic poet; born in Cologne, Germany, Nov. 17, 1587. His is the greatest name in Dutch literature, and he has often been called "The Dutch Shakespeare." He began his literary career with the drama "The Pasha," produced in 1612 before the Rhetorical Chamber, of which he was a member. He wrote the tragedy "Palamedes," and "The Amsterdam Hecuba," a free version of Seneca (1625); many translations from the classics and versions of classical originals, and the Biblical dramas, "Adam in Banishment," "Solomon," "Samson," "Noah," "Jerusalem Destroyed," "King David in Exile," "Joseph in Egypt," etc. The dramatic poem "Lucifer," the greatest of his works, is considered by many Dutch critics to be an allegorical account of the revolt of the Netherlands against

JOOST VAN DEN VONDEL.

Philip of Spain. His collected works, together with a life of the poet, were published at Amsterdam (1850–1869) in 12 volumes. He died in Amsterdam, in 1679.

**Voneisen, Franz.** See ZELEGUY, ZDENKO.

**Von Holst.** See HOLST.

**Von Ranke, Leopold.** See RANKE, VON.

**Von-Visin, Denis Ivanovich** (fōn-fēs'-in), a Russian poet; born in Moscow, April 14, 1744. He wrote: "The Brigadier," a comedy (1766), which won for him instant celebrity; it was followed by his masterpiece, the comedy "Mother's Darling Son" (1782); and the same year appeared his "Questions to Catherine II." He left an unfinished autobiography, "Frank Confession of My Thoughts and Doings." He died in St. Petersburg, 1792.

**Voodoo,** or **Voudoo,** a name given by the negroes of the West Indies and the United States to superstitious rites and beliefs brought with them from Africa, and to the sorcerer who practised these rights.

In the Southern States of the Union there was at one time a widespread and deep-rooted belief in the power of these sorcerers. As the negroes advance in education, the belief is dying away. At one time, however, despite all efforts of religious teachers to banish the mastery of this belief from the minds of the slaves, the voodoo "doctor" was an almost omnipotent individual in the estimation of his fellows. No slave

could, under any pretext, be persuaded to expose himself to the vengeance or wrath of one of these conjurors. In some cases there was a reasonable foundation for these fears; for in not a few instances has it been proven that some of the voodoos were skillful poisoners, and while the great mass of their professed art was a rank imposture, still they possessed enough of devilish skill to render them objects of wholesome dread. Their methods were as varied and variable as the winds. Anything that was mysterious, or likely to impress the ignorant mind with a feeling of terror was eagerly seized on and improved by them to their own advantage. Their services were more often invoked in destructive than in curative offices. If a negro desired to destroy an enemy, he sought the aid of the voodoo, who, in many cases, would undertake to remove the obnoxious one, and the removal was generally accomplished through the medium of poison. No doubt exists that in many cases the victim of a voodoo died from sheer fright, for whenever a negro had reason to think that he was possessed by the spell of the voodoo, he at once gave up all hope, thus hastening the accomplishment of the end toward which the energies of the sorcerer were directed. Their incantations and spell workings were always conducted with the greatest secrecy, no one being allowed to witness the more occult and potent portion of their ritual. They were frequently employed by dusky swains to gain for them the affections of their hard-hearted inamoratas, and love powders and other accessories for "tricking" constituted their stock in trade, and in some instances yielded them no insignificant revenue. The field in which voodooism flourished best was the far South among the rice, cotton, and sugar plantations, where the negroes were not brought into contact so closely with their masters as they were further North.

**Voorhees, Daniel Wolsey,** an American lawyer; born in Liberty, O., Sept. 26, 1827; was graduated at DePauw University in 1849; and admitted to the bar in 1851; began practice in Covington, Ind.; was a member of Congress in 1869–1873, and of the United States Senate in 1877–1897; served on the Senate Committee on Finance during his whole career in that body. He was also a member of the Committees on Library, Immigration, and International Expositions. The erection of the new Congressional Library was largely due to his influence. Owing to his tall and erect figure he was known as the "tall sycamore of the Wabash." He died in Washington, D. C., April 10, 1897.

**Voorhees, Philip Falkerson,** an American naval officer; born in New Brunswick, N. J., in 1792; joined the navy in 1809; and in the War of 1812, while with the "United States" participated in the capture of the "Macedonian," and while with the "Peacock" in that of the "Epervier." For his gallantry in the latter action he was voted a medal by Congress. He was promoted captain in 1838, and was assigned to the new frigate "Congress." In 1844 he captured the armed Argentine squadron and an allied cruiser which had fired on a Boston ship. The Argentine squadron was released on an apology, but the cruiser was detained, as she had led in the assault. Though Captain Voorhees was commended for his act by United States diplomatic representatives and foreign naval officers in South America, he was tried by court-martial, but the charge against him was not sustained. In 1847 he was placed in command of the East India squadron, a post equivalent to that of rear-admiral, which rank was not established till later. In 1855 he was placed on the reserve list, an action which he regarded as unjust. He appealed to President Buchanan, who placed the matter in the hands of Attorney-General J. S. Black. The latter stated in an opinion of Oct. 15, 1858, that "The history of the American navy hardly contains another instance where one man has been the victim of so many blunders." This decision led to his being replaced on the active list. He died in Annapolis, Md., Feb. 26, 1862.

**Voronezh,** a province of Russia, surrounded by Tambov, Saratov, the country of the Don Cossacks, Kharkov, Kursk, and Orel; area, 25,437 square miles. The surface is in general level, with gentle undulations and chalk hills of no great elevation. The principal river is the Don, with a course from N. to S. of 390 miles. It receives near the town of Voronezh, the river Voronezh, with its affluent the united Usman and Chava. The principal crops raised are corn, potatoes, beetroot, tobacco, garden produce, and sunflowers, from the seeds of which an excellent oil is procured. In the fine pastures of Voronezh horses and cattle are largely reared. The chief exports are corn and other agricultural produce to Rostov, wool to Kharkov, cattle to St. Petersburg and Kharkov, and horses to most of the provinces of Russia. Pop. (1909) 3,215,100.

Voronezh, the capital, at the influx of the river Voronezh into the Don, is 310 miles N. N. W. of Rostov. Founded in 1586 as a stronghold against the Tartars, it first became important in the time of Peter I., to whom a monument was raised here in 1860. It has 22 churches, 3 monasteries, extensive tanning industries, and carries on a large trade in corn, sugar, and oil. Pop. (1906) 71,071.

**Vorosmarty, or Voeroesmarty, Mihály** (vö-rösh-mar'ty), a Hungarian writer; born in Nyek, Hungary, Dec. 1, 1800;

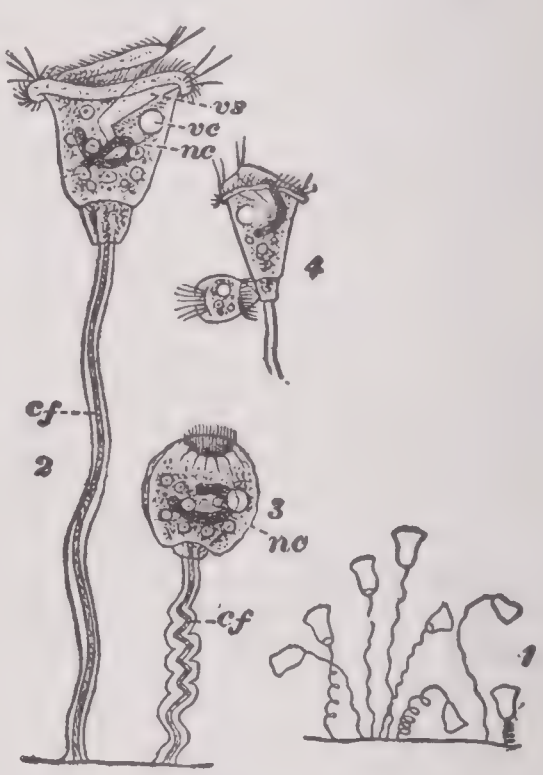
published "King Solomon," a drama, in 1821, which was followed by a poem, "The Triumph of Fidelity" (1827); "King Sigismund," a drama (1824); "The Flight of Zalan," an epic poem; the tragedy "Kont" (1825). His narrative poems entitled "Cserhalom," and "The Enchanted Valley," established his reputation as the first Hungarian poet of his time. He was a contributor to Kisfaludy's "Aurora," and was for several years editor of a journal called "The Repository of Science." In 1830 he published a patriotic lyric entitled, "The Appeal," for which he received from the Hungarian Academy a ducat a line. He took an active part in the Hungarian revolution of 1848, and was twice condemned to death, but reprieved. The failure of the revolution led him to withdraw to private life and to cease writing for years, but before his death he began a translation of Shakespeare, which was left incomplete. He died in Budapest, Hungary, Nov. 9, 1856.

**Vortex,** ordinarily, a whirlpool. When any portion of a fluid is set rotating round an axis a vortex is produced. Familiar examples are seen in eddies, whirlpools, waterspouts, whirlwinds, and on a larger scale in cyclones and storms generally. The theoretical investigation of vortex motion forms a difficult branch of hydrokinetics, and only lately has any distinct progress been effected, mainly by the labors of Stokes, Helmholtz, and Lord Kelvin. Helmholtz has proved that if, in a frictionless fluid, a vortex-filament, *i. e.*, a column rotating round a central axis, exists, it must either return into itself so as to form a vortex-ring, or it must extend through the fluid till it reaches the bounding surface; and also, that where such vortex motion does exist it must always exist, and where it does not exist it never can by physical means be made to exist. Hence the reason why we can form vortices at all is because our fluids are not frictionless; indeed, fluid friction is not only the sufficient but seems to be a necessary cause of vortex motion, so that practically vortex motion is an inevitable accompaniment of the relative motion of portions of fluid. Of course, because of this friction a vortex-filament left to itself speedily disappears, its energy being lost in overcoming the viscosity of the fluid. Another of Helmholtz's interesting theorems is that if a vortex-filament is drawn out, it at the same time contracts and rotates faster. This may be effected by moving the filament terminating in two bounding surfaces into a region where the surfaces are further apart. On the indestructibility of vortex motion Lord Kelvin built his beautiful hypothesis of the vortex-atom, which is simply a vortex-filament returning into itself after, it may be, several knottings. The simple vortex-ring is frequently formed by the smoke emanating from a funnel or a cannon's mouth, and may be very simply produced, as was done first by Tait, by projecting smoke rings from a hole in one side of a box filled with sal-ammoniac by impacts on the cloth or india-rubber sheeting which forms the opposite side. By such apparatus various curious properties of these vortex-rings may be demonstrated, such as their rebounding after collision like elastic solids, their spreading out indefinitely as they approach a plane surface, and the tendency which the foremost of two rings has to expand and slacken speed and permit its contracting and accelerated successor to shoot through it. The latest application of the vortex theory which Lord Kelvin has made is to explain the curious anomalies existing in the tides of the English Channel. His results were given in a paper read before the Royal Society of Edinburgh in March, 1879.

**Vortex Atom.** See VORTEX.

**Vortex Ring.** See VORTEX.

**Vorticella,** or **Bell-animalcule,** a genus of stalked infusoria, having a fixed stem capable of being coiled into a spiral form,




VORTICELLA (AFTER HOWES).

1, general appearance of a group, magnified; 2, single individual fully extended; 3, the same with spirally contracted stalk; 4, liberation of half of a divided unit; nc, nucleus; vs, mouth; vc, vacuole; cf, contractile filament of stalk. Nos. 2, 3, 4, highly magnified.

and vibratile organs called cilia fringing the bell-shaped disk or head, which are constantly in rapid motion and attract particles of food. The species are very numerous in fresh water, and are generally microscopic.

**Vorticellidæ,** in zoölogy, a family of peritrichous Infusoria, with three sub-fam-

ilies: *Vorticellina, Vaginicolina,* and *Ophrydina.* Animalcules sedentary or attached, from salt or fresh water, ovate, campanulate, or sub-cylindrical; oral aperture terminal, eccentric, associated with a spiral fringe of adoral cilia, the right limb of which descends into the oral aperture, the left limb encircling a more or less elevated, protrusible, and retractile ciliary disk. They increase by fission, by the conjugation of two dissimilar zoöids, the one (male?) minute and migrant, the other (female?) normal and sedentary, and by the development out of the endoplast of minute free-swimming germs.

**Vortigern,** a British prince who flourished in the 5th century. According to Gildas, Bede, Ethelwerd, and the "Old English Chronicle," he invited Hengist and Horsa to assist him against his enemies the Picts and Scots. Nennius, on the other hand, represents the German chiefs as exiles who went to the island unasked. Whichever form of the story be true, it seems certain that after a short time the newcomers, reinforced by fresh bands of their countrymen, turned against Vortigern and wrested from him the Kentish territory. Nennius is the first to bring "the beautiful daughter of Hengist" on the scene. He does not, however, name her. This is first done by Geoffrey of Monmouth (12th century), who in the main follows and expands the version of Nennius. Geoffrey calls her Rowena, or, according to some MSS., Ronwen and Ronwenna; and he is the first to tell the familiar legend of the lady making a low curtsy to Vortigern and saying, as she offered him a cup of wine, "Lauerd King, wacht heil," and how the "devil" made him so enamored of the lovely pagan that he married her that same night. There is something like unanimity in the chroniclers regarding Vortigern's character. He was at once tyrannical and lascivious; and monkish indignation (as expressed in the legend of St. Germanus) affirms that he was finally destroyed by fire from heaven. It is to be presumed that Vortigern came to a violent end in conflict with the heathen adventurers who had established themselves in his dominions.

**Vos, Bert John,** a Dutch-American educator; born in Katwyk-ap-Zoom, Holland, Oct. 27, 1867; was educated in his native land, and graduated at the University of Michigan in 1888. He studied at Johns Hopkins University in 1888–1891 and at the University of Leipsic in 1891–1892; was instructor of German at the University of Chicago in 1892–1893; associate instructor of the same at Johns Hopkins University in 1893–1898; and then associate professor there. He was the author of "Materials for German Conversation" (1900); "Monographs on Middle High German Style and Rhyme Technic"; etc. He also translated from the German "Religion of the Ancient Teutons" (1901).

**Vosges,** a department in the E. of France; bounded N. by Meurthe-et-Moselle and Meuse, W. by Haute-Marne, S. by Haute-Saône, and E. by Elsass; area 2,269 square miles; pop. (1906) 429,812. The surface is covered in the E. by the wooded summits of the Vosges Mountains, and in the W. consists of fertile undulating plains. It is watered by the Moselle, with its affluents the Moselotte, Vologne, Madon, and Meurthe; the Meuse with the Mouzon and the Vaire; and the Saône with its affluent the Coney. The industries include silk and wool spinning and weaving, embroidery and lace-making, bleaching and dyeing, and the manufacture of glass, pottery, paper, beet sugar, beer, leather, and machinery. The capital of the department is Epinal.

**Vosges Mountains,** a range of hills in the E. of France, bounding the valley of the Rhine on the W. and parallel with the Schwarzwald in Baden. They are connected in the N. with the Hardtin Rhenish Bavaria, in the S. W. with the Faucilles, the Côte-d'Or, and the Cevennes, and in the S. they unite with offsets from the Jura. The summits are usually rounded, hence called ballons, and are covered with a rich green turf, on which for six months of the year large herds of cattle graze. Their sides are clothed with forests of fir, oak, and beech. Their highest summits range from 3,000 to over 4,000 feet, culminating in Ballon de Guebriller, 4,700 feet above the sea.

**Vosmaer, Carl** (vos'mär), a Dutch author; born in The Hague, Holland, March 20, 1826. He is best known outside of his own country as the author of "The Amazon" (1881), a novel, which was translated into English, French, and other languages. Other works are: "Studies on War and Art" (1856); "Sketches" (1860), verse; "Life of Rembrandt" (1869); "Franz Hals" (1874); "Our Contemporary Artists" (1881); a translation of the Iliad and Odyssey. He died in Montreux, Switzerland, June 12, 1888.

**Voss, Gerhard Johann** (fōs), usually styled Vossius, a Dutch philologist; born near Heidelberg, in 1577. In certain departments of archæophilology he made valuable original researches; and he was the first to indicate the historical evolution of the Latin language. Among his writings are: "Essays on Rhetoric; or, The Institutes of Oratory," his greatest work (1606); "The Greek Historians" (1624); "The Latin Historians" (1627); "Aristarchus; or, On the Art of Grammar" (1635); "Of Errors of Speech and Latino-

Barbarous Terms" (1640); "Heathen Theology" (1642); "The Times of the Ancient Poets" (1654); "Etymology of the Latin Language" (1662). The "Correspondence of Vossius with Eminent Men" was published in 1691. He died in Amsterdam, March 7, 1649.

**Voss, Heinrich,** a German philologist; born in Otterndorf, Germany, Oct. 29, 1779; son of Johann Heinrich. He was Professor of Philology at Heidelberg, in succession to his father. He was a warm friend of Jean Paul Richter, and his literary executor. He completed his father's translation of Æschylus (1826); this work, as also the "Correspondence between Heinrich Voss and Jean Paul" and "Communications regarding Goethe and Schiller, in Letters by Heinrich Voss," appeared after his death. He died in Heidelberg, Oct. 20, 1822.

**Voss, Isaak V.,** son of Gerhard J.; born in Leyden, Holland, in 1618. Among his writings are: "The Seventy Interpreters: Their Translation and Their Chronology" (1661); "Of the Singing of Poems and the Power of Rhythm" (1653); "A Book of Various Observations" (1685). He died in Windsor, England, Feb. 21, 1689.

**Voss, Johann Heinrich,** a German poet; born in Sommersdorf, Germany, Feb. 20, 1751. He received a scanty school education, acted for a time as private tutor in a family, and in 1772 went to Göttingen, where he studied the classical and modern languages, and was one of the founders of the Göttingen Dichterbund, or Poet's Union. In 1775 he retired to Wandsbeck, in order to edit the "Almanac of the Muses," which he published till 1800. In 1778 he became rector of a school at Otterndorf, in Hanover, and in 1782 went as rector to Eutin. In 1805 he became professor at Heidelberg. Between 1785 and 1802 he published several volumes of original poems, the best of which is the idyl, "Luise." Among his translations that of Homer's works is undoubtedly the greatest, being the classical German version of these great epics. A translation of Shakespeare, which he undertook with his sons, was published in nine volumes in 1829. He died in Heidelberg, March 29, 1826.

J. H. VOSS.

**Voss, Julius von,** a German story-writer; born in Brandenburg, Germany, Aug. 24, 1768. His rapidity of literary production was almost without a parallel. His best story is "The Schildburger" (The Fooltownite: 1823). He wrote a great many comedies, farces, and satirical parodies. In "The Strahlow Haul of Fish" (1822), a popular piece with songs, in the Berlin patois, he gives the first example of the Berlinese farce. He died in Berlin, Nov. 1, 1832.

**Voss, Richard,** a German poet; called the "Tired Man"; born in Neugrape in Pomerania, Prussia, Sept. 2, 1851. Among his dramatic compositions are: "Savonarola" (1878); "Magda" (1879); "The Patrician Dame" (1881); "Luigia Sanfelice" (1882); "Father Modestus" (1883); "The Czar's Moor" (1883), after a fragment by Pushkin; "Woe to the Besieged" (1889); "Eve" (1889); "Betwixt Two Hearts" (1893); "At Sedan" (1895). In narrative verse he wrote: "A Hill Asylum" (1882); "Roman Village Tales" (1884); "Messalina" (1881). Among his novels are: "Life Tragedy of an Actress" (1883); "The New Romans" (1885); "Children of the South" (1888); "Villa Falconieri" (1895). He excels in description of Italian lowly life.

**Votaw, Clyde Weber,** an American educator; born in Wheaton, Ill., Feb. 6, 1864; was graduated at Amherst College in 1888; at Yale Divinity School in 1891, and in post-graduate work at the University of Chicago in 1896; was reader and instructor in Biblical literature at the latter institution in 1892–1896, instructor of New Testament literature in 1896–1900; and was then made Professor of Biblical Greek. His publications include "Inductive Studies in the founding of the Christian Church"; "Use of the Infinitive in Biblical Greek"; "The Primitive Era of Christianity"; "The Transition from Judaism to Christianity" etc.

**Voussoir** (vös-swär'), in architecture, one of the stones which form the arch of a bridge, vault, etc., and are always cut more or less in the shape of a truncated pyramid or wedge. The under sides of the voussoirs form the intrados or soffit of the arch, and the upper sides the extrados. The middle voussoir is called the keystone of the arch.

**Voting Machine.** See BALLOT.

**Vow,** a kind of promissory oath made to God, or to some false deity, to do or to forego something for the promotion of His glory, or to perform some act, or to dedicate to the deity something of value, on the fulfillment of certain conditions, or in the event of the vower receiving something specially desired, as recovery from illness, deliverance from danger, success in an enterprise, or the like. A vow may take the form of a solemn promise to follow out

some line of conduct, or to consecrate or devote one's self, wholly or in part, for a longer or shorter time, to some act or service, or to maintain fidelity and constancy.

The practice of making vows appears in the religious history of all races in any degree civilized. It entered largely into the Mosaic Dispensation (Gen. xxviii: 20–22; Lev. xvii: 2; Num. xxx: 2, etc.). In Deut. xxiii: 21, the necessity of fulfilling a vow is insisted on (Eccles. v: 4, 5), but in the following verse it is pointed out that there is no sin in forbearing to make a vow. The practice continued among the Jews in New Testament times (Acts xviii: 18). With the rise of monachism, vows to observe the "evangelical counsels" of voluntary poverty, perpetual chastity, and entire obedience became common and prevailed in the Church till the Reformation, when the Reformers taught that, since it was the duty of every man to devote himself and all his possessions to the service of God, vows were unnecessary. Vows, however, still enter largely into the religious system of the Roman Church. To the three vows (poverty, chastity, and obedience) taken by all members of religious orders, a fourth, that of stability (remaining in the order) is sometimes added. In addition to these there are private vows — of chastity, pilgrimage, etc.

Vows are of two kinds, simple and solemn, the difference between them being that the latter are instituted as such, and accepted as irrevocable by the Church, and they constitute one of the marks of a religious order as distinguished from a congregation. Simple and solemn vows differ also in their effects. A simple vow makes marriage unlawful, and deprives the person who has made it of a right to use any property he may possess; a solemn vow makes marriage invalid, and takes away all dominion over property. Solemn and certain simple vows, as those of chastity and of greater pilgrimage, can only be dispensed by the Pope, or by a superior specially delegated for the purpose; but most of the simple vows can be dispensed by the bishop of the diocese in which the person who has made the vow resides.

**Vowel,** a sound uttered by simply opening the mouth or vocal organs; a sound produced by the vibration of the vocal cords. The pitch or tone of a vowel is determined by the vocal cords, but its quality depends on the configuration of the mouth or buccal tube. A, i, and u are by philologists called the primitive vowels, and from them all the various vowel sounds in the Aryan languages have been developed. A vowel differs from a consonant in that the former can be pronounced by itself, while a consonant requires the aid of a vowel to be sounded with it. While there are only 5 vowel characters, yet there are 14 vowel and 5 diphthongal sounds in English.

**Vox Angelica,** an organ stop consisting of two ranks of pipes of small scale and delicate quality of tone, one of which is tuned slightly sharp, in order to produce a wavy and tremulous sound. Called also *Voix céleste, unda maris,* etc.

**Vox Humana,** a reed stop in the organ intended to imitate the sounds of the human voice, consisting of a large reed and short tube; called *voce humana* in Italian, *voix humaine* in French, and also anthropoglossa.

**Voyageur,** a traveler; specifically applied in Canada to a class of men employed by the fur companies in transporting goods by the rivers and across the land to and from the remote stations of the Northwest. They are nearly all French Canadians or half-breeds.

**V-pug,** the *Eupithecia coronata,* a pug moth. The fore wings are green with numerous black and pale markings, the most conspicuous of which is a V-shaped black mark, whence the name. The caterpillar feeds on the traveler's joy, the agrimony, the golden rod, and the wild angelica.

**Vraz, Stanko** (fräch), a Croatian poet; born in Zerovec, in Lower Styria, Austria, June 30, 1810. Among his works are: A collection of Slovenian folk songs from Styria, Ukraine, Carintha, and Western Hungary (1839); and "Rose-Apples" (1840), a collection of love songs. He died in Agram, Hungary, May 24, 1851.

**Vuillaume, Jean Baptiste** (vwē-yōm′), a French violin maker; born in Mirecourt, France, Oct. 7, 1798. He acquired skill under his father, settled in Paris in 1818, revived the laws of acoustics in the manufacture of violins and imitated the instruments of Stradivarius, the Amatis and Maggini. He invented a machine for reproducing any model, and made bows after the model of Tourte. He produced over 3,000 violins. In the Paris exposition in 1867 he was ranked above competition. He died in Paris, in 1874.

**Vulcan,** in mythology, the Roman god of fire and the patron of all metallic handicrafts; the son of Jupiter and Juno, and identical with the Greek Hephæstus. Being extremely ugly and deformed, Juno, ashamed to own such a child, dropped him from heaven, when the infant god, falling into the sea, was rescued and adopted by Thetis, who kept him till nine years of age. He was then restored to his parents. Soon after his return to Olympus, Vulcan took his mother's part in one of the quarrels between husband and wife; Jupiter, enraged at Vulcan's audacity, flung him from heaven. After traveling a whole day, the youth alighted on the island of Lemnos, breaking his ankle in the fall; here he raised forges

and workshops, and became the chief of artificers; some poets, however, fix his workshop on Olympus, another on Etna, where Cyclops were his ministers and chief assistants, by whose aid he fabricated all the great works attributed to him. He fashioned Pandora, and had Venus given him for his wife, by whom he was father of Cupid. Vulcan is represented bearded, cov-

VULCAN.

ered with dust and soot, and blowing the fires of his forges, or else in the act of forging Jove's thunderbolts.

**Vulcan,** in astronomy, the name given to a planet, imaginary or real, between the Sun and Mercury. On March 26, 1859, M. Lescarbault, a village physician of Orgères, Eure-et-Loire, France, saw, or fancied that he saw, a small dark planet-like body pass across the sun's disk. In September the alleged discovery reached Leverrier, who eagerly grasped it, as he had previously come to the conclusion that the motions of Mercury were affected by the perturbation of a planet between it and the sun. He even went so far as hypothetically to calculate the elements of the new planet. M. Liais stated that he was examining the sun at the very moment of M. Lescarbault's supposed discovery, and was certain that no dark body passed across the disk. The planet was called by anticipation Vulcan, but its existence still remains unconfirmed though M. Porro and M. Wolf of Zurich reported seeing its transit in 1876.

**Vulcan, The,** the name of an American naval repair ship. In 1891, the Navy Department contracted for the purchase of the steamship "Ohio" to convert it into a floating machine shop; but the scheme was abandoned. The idea was revived during the American-Spanish War and the old "Chatham" of the Merchants' and Miners' Transportation Line was made over into the repair ship "Vulcan." The presence of this adjunct to the fleet removed the necessity for sending injured vessels to Key West for repairs. The "Vulcan" was also of service in overhauling and restoring captured Spanish ships, the repairing of the "Sandoval" being one of the most important instances. While the larger vessels of the navy have machine shops aboard, these are necessarily very small, and are designed merely to repair the minor breaks, and, generally, the moving machinery; but the "Vulcan" has in addition to the ordinary tools, a foundry outfit, and boilermakers, coppersmiths, and blacksmiths outfits. Besides the operating crew she carried during the operations at Santiago, 50 machinists, 25 boilermakers, 6 coppersmiths, 6 blacksmiths, 40 helpers, 4 patternmakers and 6 molders. The vessel is 265 feet long, 40 feet beam, 26 feet depth of hold, draught 17 feet forward, 20 feet 6 inches aft, tonnage 2,700. See NAVAL FLEET.

**Vulcanist,** in geology, one who attributed to igneous agency the formation of various rocks, notably basalt, etc., supposed by the Neptunists, led by Werner (1750–1817), to have been deposited from a chaotic aqueous fluid. The controversy became vehement, and the two parties degenerated into warring factions, the Vulcanist hypothesis ultimately holding the field. Called also Plutonists.

**Vulcanite,** a hard and non-elastic variety of vulcanized rubber, used for making combs, dental plates, and numerous other objects. It contains from 30 to 60 per cent. more sulphur, and is subjected to a higher and more prolonged heat in curing than ordinary vulcanized rubber. It is of a brownish-black color, is hard and tough, cuts easily, is susceptible of a good polish, and is not affected by water or any of the other caoutchouc solvents. It evolves a considerable amount of electricity when rubbed, and is hence much used in the construction of electric machines. In petrology, a name sometimes given to pyroxene.

**Vulcanization,** the act or process of vulcanizing, or of treating caoutchouc or india-rubber with some form of sulphur, to effect certain changes in its properties; as to render it insensible to atmospheric changes, increase its durability, and adapt it for various purposes in the arts. This was originally effected by dipping the rubber in melted sulphur, and heating it to nearly 300°. Several other methods have been employed. The substance thus formed is elastic at all temperatures, cannot be dissolved by the ordinary solvents, and resists the effects of heat within a considerable range of temperature. Vulcanized india-rubber is largely used for many useful purposes, as for waterproofing cloth, for boots, shoes, mats, toys, belting, buffers, wheel-tires, washers, valves, pipes, fire-hose, medical and surgical appliances, etc.

Vulgate

**Vulgate,** the edition of the Latin Bible which, having been sanctioned by the usage of many ages in the Roman Church, was pronounced "authentic" by the Council of Trent. The name was originally given to the "common edition" of the Septuagint used by the Greek Fathers, and thence transferred to the "Itala" or the "Old Latin" version of both Old and New Testaments current during the first centuries in the Western Church. It finally passed to the present composite work, which gradually took the place of the "Old Latin." The relation of the component parts of this venerable version to the original texts will be best understood by a description of the work of St. Jerome, from whose hand it mainly proceeded. In the time of Pope Damasus, toward the end of the 4th century, the text of the "Old Latin," the origin of which is lost in obscurity, had fallen into considerable confusion. It was a very literal representation of the Greek, rude in style and full of provincialisms. Every one, it seems, who had a smattering of Greek, thought fit to make alterations; and so great became the variety of recensions that it is still a matter of dispute whether there was not at their basis a number of independent translations rather than a single version often retouched.

To remedy the evil Jerome, at the request of Damasus, A. D. 382, undertook a revision of the New Testament. He corrected the Gospels thoroughly, though with great caution, and the rest more cursorily, with the aid of Greek codices which were then reputed ancient and trustworthy. The critical value of the result as a primary witness to the Greek text in its best state in the 4th century has recently been generally recognized. Jerome next turned his attention to the Psalms. He at first merely corrected the Latin from the "common edition" of the Greek, and this revision, called the "Roman Psalter," completed in 383, was introduced by the Pope into the Roman liturgy, and is to this day used in the Ambrosian or Milan rite and in St. Peter's at Rome. Shortly after Jerome made a more thorough revision by the aid of Origen's Hexapla; and it is this, the so-called "Gallican Psalter," which is now read in the Vulgate.

After the death of Damasus, Jerome was induced by the urgency of private friends to undertake a more serious task, a new translation of the Old Testament from the Hebrew. This he accomplished in Palestine, where he had perfected himself in Hebrew with the assistance of learned Jews, during the years A. D. 390–405. To this work he added a free translation of the books of Tobit and Judith from the Chaldee version of the original Hebrew, now lost. The other books of the Greek canon, afterward incorporated with the rest of his work — viz. Wisdom, Ecclesiasticus, and Maccabees — were left by him untouched; and these, with, in a somewhat less degree, the Psalms and the New Testament, are of especial value to the linguist, preserving as they do, quite apart from their Grecisms, many lexical and grammatical forms, relics of the dialect of the people, which are not found in the classical or literary language. The new translation met at first with much opposition. The Fathers had been accustomed to regard the Septuagint as an inspired version, and Jerome's departure from that version appeared to be a dangerous innovation. It won its way by degrees, and by force of its intrinsic worth. Gregory the Great says that in his time the Roman See made use of both versions. Venerable Bede speaks of St. Jerome's as "*our* edition"; and soon the "Old Latin" fell into disuse and neglect, so that, notwithstanding the keen researches of scholars, a complete copy of the pre-Hieronymian Old Testament cannot now be made up from the surviving fragments.

In the course of the Middle Ages the Vulgate necessarily contracted some corruption. Charlemagne, with the aid of Alcuin, took pains to procure and disseminate a pure text; and later on, with the same object, the University of Paris and some of the religious orders compiled "Correctoria," or lists of common errors with their corrections. The numerous editions printed in the 15th century were of no critical value, but in the first half of the following century several attempts were made to provide a revised and authoritative text, the most important editions being those of R. Stephens (1528, and later) and of the Louvain theologians (first under the care of Henten of Malines in 1547, and secondly with the coöperation of Lucas of Bruges and the printer Platin, 1574). Meanwhile the carrying out of the Tridentine decree, that the Vulgate should be printed as correctly as possible, was undertaken by the Popes, who appointed commissions of cardinals and learned men for the purpose. Nearly 40 years passed, however, before their labors were brought to a close. Sixtus V. in 1590 first issued the long-expected work, together with a bull in which he ordered this edition to be received as "true, lawful, authentic, and unquestioned"; but he had of his own judgment made many important changes in the readings proposed by the commission, and these met with so little approval that the edition was after Sixtus' death almost immediately recalled, the work again submitted to a papal congregation for revision, and finally issued in 1592 as the authoritative text by Clement VIII. This Clementine Bible differed

from the Sixtine in some 3,000 readings. A few errors of the press were corrected in a second impression in 1593; and others, again, in the third and last official impression of 1598, to which standard all copies should be conformed.

The precise import of the term "authentic" applied to the Vulgate has been much discussed by Roman theologians. It is, however, clear that the council intended to make no comparison of the Vulgate with the original texts, but, considering it to be convenient that, among the several Latin versions then current, one should be guaranteed as authentic — *i. e.*, substantially representing the original, and free from all error in faith or morals — declared the Vulgate edition tested by long usage within the Church to be such. The Vulgate thus defined to be an authentic version could not be the particular Clementine edition, which was not then in existence, but the Vulgate generically, or in its purest form. Though the official text is capable of improvement, it is agreed by the best judges that the Clementine editors made use of ancient manuscripts with discernment, and proceeded throughout on sound critical principles.

**Vulpic Acid,** $C_{19}H_{14}O_5$; vulpulic acid; an acid occurring in the lichen *Cetraria vulpina.* The lichen is macerated with warm water, in presence of milk of lime, the extract treated with hydrochloric acid, and the flocculent precipitate of vulpic acid purified by recrystallization from boiling alcohol or ether. It separates from ether in transparent yellow needles, is nearly insoluble in water and absolute alcohol, more easily soluble in ether, and melts at 100°. Its salts are of no importance.

**Vulpine Phalanger,** the *Phalangista vulpeculus,* an Australian marsupial, resembling a fox in appearance, being two feet long exclusive of the tail, which is some 15 inches more. Upper parts covered with dark gray fur, lighter beneath. Called also vulpine and brush-tailed opossum.

**Vulpine Series,** in zoölogy, one of the two sections into which Huxley divides the genus *Canis.* It includes *Vulpes* (with *Urocyon,* and *Leucocyon* and *Fennecus.* Called also the alopecoid series.

**Vulpius, Christian August** (völ'pe-us), a German writer; born in Weimar, Germany, Jan. 23, 1762. He was a brother-in-law of Goethe, under whose direction he became secretary of the court theater at Weimar. He published: "Rinaldo Rinaldini" (1799), a robber romance; "Dramatic Histories of Former Times"; and a number of dramatic works. He was subsequently first librarian and overseer of the cabinet of coins at Weimar. He died in Weimar, June 26, 1827.



**Vulsinium.** See BOLSENA.

**Vulture,** any member of the family *Vulturidæ* included among the birds of prey in the sub-order *Falcones.* By some naturalists the family is sub-divided into the Old-World vultures (*Vulturinæ*) and the New-World vultures (*Sarcorhamphinæ*), while by others the latter, which are distinguished by a perforated nostril and the absence of an "after-shaft" to the feathers, are regarded as a distinct family, *Cathartidæ.* In all the vultures the head and neck are more or less bare, the beak is long and curved only at the tip; the legs and feet are large and powerful, but the toes and claws are relatively weak. They are thus well adapted for walking and feeding on the ground, but are unable to carry off their prey like the eagles and hawks. The wings are very strong, and their powers of swift and sustained flight are remarkable. Vultures are widely distributed throughout

THE KING VULTURE.

temperate and tropical regions, and the general habits of the various species are very similar, though they differ greatly in their choice of haunts. Thus one species frequents the rocky peaks of the Alps and another sweeps over the great plains of Africa; the king vulture dwells alone with his mate in the densest parts of the South American forests, while Pharaoh's chickens pick up a living as street scavengers in the towns of the East.

The chief food of the vultures is carrion; they rarely attack any living animal unless under great stress of hunger, when a wounded or feeble lamb or hare is sometimes killed. There has been much discussion as to whether vultures scent or sight their prey, but experiment has shown, apparently conclusively, that their sense of smell is not unusually acute, and they rely chiefly on their extreme keenness of vision, while the sudden descent of one bird serves as a signal to many others. When a carcass is discovered by one, others ar-

rive quickly on the scene from all points of the compass, though none may have been visible a few minutes before. Tearing off the skin with their powerful beaks they gorge themselves greedily on the flesh and entrails till nothing is left but the skull and larger bones. Smaller birds only venture to look on and watch for stray morsels which may be let fall, but in the neighborhood of towns the vulture's claim is sometimes — not often successfully — disputed by wandering dogs. After a full meal vultures may remain without food for many days. The young birds, which are carefully tended for several months, are fed by regurgitation of food from the crop of the parents.

One of the commonest European species is the griffin vulture (*Gyps fulvus*), which occurs in Spain, among the Alps, and in the Mediterranean region generally. It makes a rough nest of branches and grasses, usually in a cavity or on a ledge of an almost inaccessible cliff. One or at most two eggs are laid early in March, and the parents share the labor of rearing and tending the young. The adult bird measures 3½ feet in length; the general color is light brown with black markings, and there is a white ruff on the lower part of the neck. The eared vulture (*Otogyps auricularis*), an inhabitant of Africa, received its name from folds of skin on the head resembling ear-lappets. The Egyptian vulture (*Neophron percnopterus*) is often called Pharaoh's chicken from its frequent occurrence in ancient Egyptian hieroglyphics, where it is used as an emblem of parental love. It is very common throughout Northern Africa and Persia, and breeds frequently in the S. of Europe. More than one specimen has been killed in England. The Egyptian vulture is raven-like in form; its wings are pointed, its bill slender, and half covered with a naked cere. The adult bird is little over 2 feet in length; its plumage is white with black wing-feathers. The young birds are dark brown.

**Vyása** ("the distributor or arranger"), the traditionary author of the Vedas, the Mahabharata, the Puranas — in fact, of nearly all ancient Sanskrit religious literature. It is evident that in this name is mythically embodied the historical fact that these works at some period underwent a regular and authoritative recension. It merits notice that the Greek name of Homer is capable of being analyzed with a similar result.

**Vyatka,** or **Viatka,** a large province in European Russia; area, 59,329 square miles; pop. (1897) 3,082,788, comprising many Tartar tribes and some 50,000 Mohammedans. The products are corn, rye, barley, oats, flax, and hemp. Forests of fir, oak, elm and birch are extensive. It has manufactures of woolens, linens, potash, leather, copper, firearms, anchors, gun carriages, etc. The capital, of the same name, is a well-built town, containing 17 churches and a cathedral with an altar of solid silver, and is the commercial center of the province.

**Vyrnwy,** a river which rises in Wales and joins the Severn 8½ miles above Welshpool. By engineering operations, begun in 1881, the waters of the upper Vyrnwy were impounded for the water supply of Liverpool; and when the new supply was turned on July 14, 1892, there was an artificial lake of 1,121 acres, 4¾ miles long by 1½ broad, and containing 2,103,000,000 cubic feet of water. The retaining wall is 100 feet high, and is sunk 60 feet below ground. By the track the water follows, the distance is 68 miles from Liverpool.

W, the 23d letter of the English alphabet. It takes its form and its name from the union of two V's, the character V having formerly the name and force of U. The name "double u" is not, however, a very suitable one, being given to the letter from its form or composition, and not from its sound. In the Anglo-Saxon alphabet W had a distinctive character of its own, the modern letter being adopted in the 13th century. W represents two sounds: (1) The distinctive sound properly belonging to it, being that which it has at the beginning of a syllable, and when followed by a vowel, as in was, will, woe, forward, housework, etc.; (2) at the end of syllables, in which position it is always preceded by a vowel, it has either no force at all (or at most only serves to lengthen the vowel), as in law, paw, grow, lawful, etc.; or it forms the second element in a diphthong, as in few, new, now, vow, etc., being in such cases really a vowel, and equivalent to the u in bough, neutral, etc. It is formed by opening the mouth with a close, circular configuration of the lips, the organs having exactly the same position as they have in pronouncing the oo in foot. W is hence often spoken of as a vowel; but it is not so, as may be seen by comparing woo, wood, and woman, in which w is not equivalent to oo. W is now silent in many words and positions: (1) In words, as in gunwale, boatswain, answer, sword, two, twopence, etc.; (2) when initial and followed by r, as in wrap, write, wrong, etc. (It is, however, still sounded in this position in Scotland.) The initial wh, in Anglo-Saxon, hw, as in who (Anglo-Saxon *hwa*), whelp (Anglo-Saxon *hwelp*), had originally a gutteral sound, as seen in the Scotch *quhat* = what, *quhan* = when. It represents the cognate Icelandic hv, and Latin initial gu. In English pronunciation, in initial wh, the w is silent in who, whom; in other words it is generally pronounced with a slight aspiration after it, as in when, what, which, though there is often a tendency to suppress the h and pronounce w pure and simple. The Anglo-Saxon initial sound wl has become simple l, as in lisp; Anglo-Saxon *wlisp*. W has disappeared from some words, as from ooze = Anglo-Saxon *wós;* four = Anglo-Saxon *feower;* tree = Anglo-Saxon *treow;* knee = Anglo-Saxon *kneow*. It has crept into whole and its derivatives = Anglo-Saxon ***hal, hol;*** so whoop = French *houper*. It has disappeared from the combinations, tw, thw, and sw, as tush = Anglo-Saxon *twisc;* thong = Anglo-Saxon *thwang;* sister = Anglo-Saxon *swister, swuster;* such = Anglo-Saxon *swilc*. It represents v in periwinkle = French *pervenche,* Latin *perivinca;* and g in law = Anglo-Saxon *lagu;* saw = Anglo-Saxon *sage;* dawn = Anglo-Saxon *dagian;* marrow — Anglo-Saxon *mearg,* etc.; so wafer = Old French *gauffre, goffre,* Latin *gafrum*. Coming before an a, the w often gives the vowel an o sound, as in wad, wallow, etc. As an initial, it is used for West, as in charts: W. S. W. = West-South-West., etc. In chemistry, as a symbol for the element tungsten (Wolfram).

**Waagen, Gustav Friedrich,** a German historian of art; born in Hamburg, Germany, Feb. 11, 1794. Studied under Tieck at Breslau, Dresden, and Munich. He wrote: "Art Works and Artists of England and Paris" (3 vols. 1837–1839); "Art Works and Artists of Germany" (18 vols. 1843–1845); "The Treasures of Art in Great Britain" (3 vols. 1854); "The Most Notable Art Monuments in Vienna" (1866–1867); "The Collection of Paintings in the Imperial Hermitage at St. Petersburg" (1867). He died in Copenhagen, Denmark, July 15, 1868.

**Wabash,** a city and county-seat of Wabash co., Ind.; on the Wabash river, and on the Fort Wayne, Cincinnati, and Louisville railroad; 75 miles N. E. of Indianapolis. It is the trade and shipping center of a rich agricultural region. Here are an Academy for Young Women, a court house, a street railroad and electric light plants, a hospital, National and other banks, and several daily and weekly newspapers. The city has manufactories of carriages, shoes, flour, hats, paper, woolen goods, etc. Pop. (1890) 5,105; (1900) 8,618.

**Wabash,** a river of the United States, which rises in the N. W. of Ohio, winds across Indiana, forms the boundary between Indiana and Illinois, and falls into the Ohio, of which it is the largest N. tributary, after a course of 550 miles. It is navigable for steamboats to Lafayette.

**Wabash College,** an educational nonsectarian institution in Crawfordsville, Ind.; opened in 1832; has productive funds exceeding $625,000; grounds and buildings valued at over $280,000; scientific apparatus, etc., $30,000; volumes in the library, about 45,000; average faculty, 25; average students, 350; graduates, over 1,100.

**Wace, Henry,** an English theologian; born in London, England, Dec. 10, 1836; educated at Marlborough, Rugby, King's College, London, and Brasenose College, Oxford, graduating in 1860 with a second-class in both classics and mathematics. He served curacies at St. Luke's and St. James's; was lecturer of Grosvenor Chapel, chaplain of Lincoln's Inn (1872–1880), when he became its preacher; and acted as Professor of Ecclesiastical History in King's College (1875–1883). In 1881 he became a prebendary of St. Paul's, in 1883 chaplain to the Archbishop of Canterbury and in 1903 dean of Canterbury; was Boyle lecturer — "Christianity and Morality"—(1874–1875), Bampton lecturer — "The Foundations of Faith"—(1879), and was select preacher at Cambridge (1878), at Oxford (1880–1882), honorary chaplain to the queen (1884), and chaplain-in-ordinary (1889). His name is best known as the joint editor with Sir W. Smith of the great "Dictionary of Christian Biography" (1877–1887), and as himself the editor of the "Speaker's Commentary on the Apocrypha" (1886).

**Wace, Robert,** a Norman-French trouvère, calling himself simply Master Wace; born in the Island of Jersey about 1120. His celebrated works are two long romances, the "Roman de Brut" (Brutus), and the "Roman de Rou" (Rollo), both in Norman-French. The "Roman de Brut" is in octosyllabic couplets, is presumably founded on Geoffrey of Monmouth's chronicle, and is of commanding literary importance as the source, or supposed source, from which many subsequent poets drew their Merlin and King Arthur tales. The "Roman de Rou," mostly octosyllabic also, is a chronicle of the Norman dukes. He died about 1180.

**Wachendorfia,** in botany, the typical genus of *Wachendorfeæ;* herbs, often hairy, with a tuberous rhizome; narrowly elliptical leaves, often nerved, the larger ones radical; stem round, with bracts and small leaves; flowers in a terminal panicle, purplish-red or yellow; perianth six-cleft, in two divisions; stamens six theoretically, but three are abortive and sometimes wanting. From the Cape of Good Hope. *W. thrysiflora,* tall-flowering wachendorfia, is grown in greenhouses, or, in fine seasons, in the open air. It has fine golden-colored flowers.

**Wachenhusen, Hans,** a German author; born in Treves, Prussia, Dec. 31, 1827. He was author of: "The New Paris" (1855); "Pictures of Travel in Spain" (1857); "Journal of the Austro-Italian War" (1859); "Crescent and Double Eagle" (1860); "Rome and Sahara," a novel; "Paris Photographs" (1868); "The Poor Egyptian Man" (1871). Among his numerous stories are: "The Heart's Golgotha"; "Only a Woman"; "A Woman's Guilt." He died March 23, 1898.

**Wachler, Johann Friedrich Ludwig,** a German historian of literature; born in Gotha, Germany, April 15, 1767. His principal writings are: "Manual of the History of Literary Culture" (2 vols. 1804–1805); "Lectures on the History of German Literature" (2 vols. 1818–1819); "History of Historical Research and Art from the Renaissance" (2 vols. 1812–1820). He died in Breslau, April 4, 1838.

**Wachsmuth, Ernst Wilhelm Gottlieb,** a German historian; born in Hildesheim, Dec. 28, 1784. Among his works are: "Outline of a Theory of History" (1820); "Hellenic Antiquity" (4 vols. 1826–1830); "History of European Morals" (5 vols. 1831–1839); "History of the Age of the Revolution" (4 vols. 1846–1848); "History of German Nationality" (3 vols. 1860–1862). He died in Leipsic, Jan. 23, 1866.

**Wachsmuth, Kurt,** a German antiquarian; born in Naumburg on the Saale, April 27, 1837; became professor at Marburg in 1864, and at Leipsic in 1886. His principal works are: "Timon the Phliasian, and Other Greek Satirists" (1859); "The Doctrine of the Stoics on Divination and Dæmons" (1860); "Old Greece in the New" (1864); "The City of Athens in Antiquity" (2 vols. 1874–1890); "Introduction to the Study of Ancient Poetry" (1895).

**Wacke,** a name in use among German miners and quarrymen, and adopted by Werner. It includes the tuffs of igneous rocks of various geological ages, and also rocks of similar origin so far decomposed as to render them almost earthy, which made their exact identification before the application of the microscope exceedingly difficult.

**Wackernagel, Jakob,** a Swiss philologist; born in Basel, Switzerland, Dec. 11, 1853. He became Professor of Greek Language and Literature in the University of Basel, 1881. He wrote: "Origin of Brah-

manism" (1877); "The Study of Classical Antiquity in Switzerland" (1891); "Palæ-Indian Grammar" (1896); etc.

**Wackernagel, Wilhelm,** a Swiss linguist and antiquarian; born in Berlin, April 23, 1806; became Professor of German Language and Literature in the University of Basel. His principal writings are: "German Dictionary" (5th ed. 1878); "History of German Literature" (1848–1855); "Land Laws of the Schwabenspiegel" (1840); "Old German Sermons and Prayers" (1876); "The Little Book of Wine" (1845); and other volumes of poems. He died in Basel, Dec. 21, 1869.

**Waco,** a city of Texas, county-seat of McLennan co., 238 miles N. W. of Galveston; on the Brazos river, and on the Missouri, Kansas, and Texas, International and Great Northern, St. Louis Southwestern, Houston and Texas Central, San Antonio and Aransas Pass, and Texas Central railroads. Baylor (Bapt.) and Texas Christian universities, and St. Basil's (R. C.) and Paul Quinn (African M. E.) colleges are situated here. The leading religious denominations own forty-seven buildings. The Federal building, a county court house, and a natatorium are noteworthy structures. There is a Carnegie library in the city, and Baylor University has a collection of some 18,000 volumes. As a health resort, Waco attracts visitors by reason of its medicinal waters. In 1906 the assessed property valuation was $11,500,000. The water works are under municipal control. Waco has a large woolen mill, cotton-seed oil mills, compresses, and numerous other manufacturing interests, and is the cotton market of central Texas. Pop. (1900) 20,686; local est. (1907) 26,762; (1910) 26,425.

**Wad,** in gunnery, a compressible disk. which separates the powder from the projectile. Formerly it was forced home immediately after the powder; in modern ordnance it forms a portion of the cartridge.

**Wad,** or **Bog Manganese,** a massive brownish-black mineral composed mainly of the hydrated peroxides of manganese and iron. It is usually mechanically mixed with other oxides and organic acids, and is formed in low situations from the decomposition of manganese minerals.

**Wadai,** or **Waday,** an extensive and powerful negro State in the Central Sudan; between Kanem and Bagirmi in the W. and Darfur in the E.; area, 170,000 square miles; pop. 2,000,000. It consists principally of an elevated plateau, very fertile in some parts, producing abundantly maize, millet, indigo, cotton, etc. Ivory and slaves are also largely dealt in. The inhabitants are warlike, and their sultan exercises tributary rights over several neighboring settlements. It came under French protection in 1903. Capital, Abeshr.

**Wadding, Luke,** an Irish ecclesiastic; born in Waterford, Ireland, Oct. 16, 1588; after studying theology at the Lisbon Jesuit Seminary, entered the Franciscan order (1605), and became Professor of Divinity in the University of Salamanca. As chaplain to an embassy dispatched to treat concerning the doctrine of the Immaculate Conception, he went to Rome in 1618, and settling there, founded the Irish Franciscan College of St. Isidore (1625), acted as papal councilor in the great controversy with the Jansenists, whose tenets he shared at first, but presently renounced; and was procurator of his order (1630–1634) and vice-commissary (1645–1648). He refused a cardinal's hat, and died in Rome, Nov. 18, 1657, having himself composed the "Annals of Minor Ordinances" (8 vols. 1626–1640; new ed. 22 vols. 1731–1747), and "Scriptures of Minor Ordinances" (1660; new ed. 1806), and edited Calasio's posthumous "Biblical Concordance" (4 vols. 1621) and the works of Duns Scotus (12 vols. 1620).

**Waddington, George,** an English educator; born Sept. 7, 1793; son of Rev. George Waddington, vicar of Tuxford, Nottinghamshire. A brilliant university career at Cambridge was rewarded by a fellowship in Trinity College; and after several years of foreign travel he received the vicarage of Marsham in Yorkshire. In 1840 he was made dean of Durham, and in the following year warden of Durham University. He was a man of liberal opinions and abundant generosity; his gifts to benevolent institutions both in London and Durham were often princely in their amount. His chief works are: "Journal of a Visit to Some Parts of Ethiopia (1822); "A Visit to Greece in 1823 and 1824" (1825); "Present Prospects of the Greek or Oriental Church" (1829); "History of the Church from the Earliest Ages to the Reformation" (13 vols. 1835); "History of the Reformation on the Continent" (3 vols. 1843). He died July 20, 1869.

**Waddington, William Henry,** a French statesman; born in Paris, Dec. 11, 1826; was educated at Rugby and Trinity College, Cambrige, and took a classical first-class, with a chancellor's medal, in 1849. He returned to France, and devoted himself to the study of antiquities, extending his journeys to Asia Minor, Syria, and Cyprus. In 1865 he was elected to the Academy of Inscriptions and Belles Lettres. In February, 1871, he was returned by Aisne to the National Assembly, giving a steady support to Thiers. From 1876 till 1885 he

sat as senator for Aisne. He served as minister of Public Instruction in 1873 (for a few days only) and in 1876–1877, as minister of Foreign Affairs (1877), plenipotentiary at the Berlin Congress (1878), president of the Council (1879), and was ambassador at London from 1883 to 1892. He died Jan. 13, 1894.

**Waddell, James Iredell,** an American naval officer; born in Pittsboro, N. C., July 13, 1824; entered the United States navy in 1841. In 1862 he joined the Confederate navy; served on several missions; and in 1864 took command of the "Shenandoah" and began a piratical warfare on American shipping on the high seas, capturing 38 ships. After the war he returned to the United States, and was for a time a captain in the service of the Pacific Mail Steamship Company. He died in Annapolis, Md., March 15, 1886.

**Wade, Benjamin Franklin,** an American statesman; born in Springfield, Mass., Oct. 27, 1800. About 1821 he removed to Ohio, where he was employed as a school teacher for several years. He studied law and was admitted to the bar in 1825. In 1837 and 1841 he was elected State Senator; in 1847 was chosen presiding judge of the 3d Judicial District of Ohio; and in 1851, 1857, and 1863 was elected United States Senator. He was an advocate of the Homestead bill, voted for the repeal of the Fugitive-Slave Law, and opposed the Nebraska-Kansas bill of 1854. During the Civil War he was prominent in public affairs. In the session of 1861–1862 he was appointed chairman of the Joint Committee on the Conduct of the War. He also served as president of the Senate and acting Vice-President of the United States. At the Republican National Convention, in Chicago, May 21, 1868, he received more votes on the first four ballots for the nomination for Vice-President than any other candidate; but failed to obtain the nomination. Excepting to serve as a commissioner to Santo Domingo, he took no prominent part in public affairs after 1869. He died in Jefferson, O., March 2, 1878.

**Wade, James F.,** an American military officer; born in Ohio, April 14, 1843; entered the Union army as 1st lieutenant in the cavalry in 1861; served with distinction throughout the Civil War; was brevetted colonel and Brigadier-General of volunteers in 1865; commissioned major of the 9th Cavalry, U. S. A., in 1866; promoted colonel in 1891, and Brigadier-General in 1897; and in May, 1898, was appointed a Major-General of volunteers. After the war with Spain, in which he took an active part, he was placed at the head of the American Cuban Evacuation Commission; in January, 1899, became military governor of Cuba; and subsequently was appointed commander of the Military Department of Dakota.

**Wade, Sir Thomas Francis,** an English diplomatist; born in 1820; entered the army in 1838, and served in China and other parts of the East. He was appointed interpreter to the garrison at Hong Kong (1843), assistant Chinese secretary (1847), vice-consul at Shanghai (1852), and Chinese secretary at Hong Kong (1855). His intimate knowledge of the Chinese character and language led to his being attached to Lord Elgin's mission to China (1857–1859), and as Chinese secretary he accompanied his lordship to Peking on his special mission (1860). In 1862 he became Chinese secretary and translator to the British legation in China; acted as charge d'affaires at Peking (1864–1865 and 1869–1871); and in the last of these years was appointed envoy extraordinary, minister plenipotentiary, and chief superintendent of British trade in China. In November, 1875, he was made a K. C. B. for his success in diplomacy and in furthering the interests of British commerce. He was the author of "Tziü-Erk Chi" (1867), a progressive manual of the Chinese tongue. He died July 31, 1895.

**Wadelai,** a military post in the Equatorial Province of what was formerly the Eyptian Sudan; on the Albert Nyanza. It is famous as the chief station of Emin Pasha (Dr. Edward Schnitzer), governor of the province, who, after the Mahdist rising, was cut off from civilization, and who was relieved by Stanley.

**Wadham College,** a college connected with Oxford University, England; founded in 1610 by Dorothy, widow of Nicholas Wadham, of Mayfield, Somersetshire, England, for a warden, 15 fellows, 15 scholars, 2 chaplains, and 2 clerks. One of the fellowships was diverted (1857) to the endowment of the chair of experimental philosophy; the scholarships have an annual value of $400, and are tenable for five years; and there are besides 10 Hody exhibitions (six Greek, four Hebrew) of $250, two Wright exhibitions (1874) for scholars of Manchester grammar school, etc. Wadham College, whose library is rich in rare Spanish books, presents to 12 livings.

**Wadi** (Arabian, "ravine"), in Palestine and Arabia, either a river or river valley, or the basin of a torrent. Renan thinks this word was adopted by the Greeks and corrupted into oasis. It has passed into the Spanish guad, with which many of the Spanish river names begin; thus Wadi-l-Kebir (Arab. "great river") appears as Guadalquivir, Wadi-l-hajarah ("river of stones") as Guadalaxara. The ravines of

Malta commonly go by the name of vyed or wied, a corrupted form of wadi.

**Wadhurst Clay,** in geology, a sub-division (the second from the top) of the Hastings sand. Toward its base there are nodules and thin beds of clay ironstone, which, from the time of Henry III. till the first quarter of the 19th century, furnished the chief iron ore smelted in England.

**Wadleigh, George Henry,** an American naval officer; born in New Hampshire, Sept. 28, 1842; was graduated at the United States Naval Academy in 1863, and assigned to duty in the West Gulf Blockading squadron, where he remained till the end of the Civil War. He was present at the attack upon Fort Powell in March, 1864; took part in the battle of Mobile Bay, Aug. 5, 1864, and in the subsequent operations resulting in the surrender of Fort Morgan in 1865; and after the war served in various stations; was on the special Arctic cruise in search of the "Jeannette" in 1881, and commanded the cruiser "Minneapolis" on the coast of Asia Minor for the protection of American missionaries in 1895–1897. During the American-Spanish War he was in command of the flagship "Philadelphia" in the Pacific station and was afterward assigned to the command of the receiving ship "Wabash" at the navy yard at Boston.

**Wadlin, Horace Greely,** an American statistician; born in Wakefield, Mass., Oct. 2, 1851; was educated at public and private schools, and studied architecture in Salem and Boston, Mass.; was an architect in the latter city in 1875-1879. He became chief of the Massachusetts Bureau of Statistics of Labor in 1888; was a member of the Massachusetts Legislature in 1884-1888; supervisor of the United States census in 1890 and 1900, and of the State census in 1895; and librarian Boston Public Library from 1903. His publications include: "Reports on the Statistics of Labor of Massachusetts" (12 vols. 1888–1899); "Annual Statistics of Manufactures of Massachusetts" (14 vols. 1888–1889); "The Decennial Census of Massachusetts" (7 vols. 1895); etc.

**Wadsworth, James Samuel,** an American military officer; born in Geneseo, N. Y., Oct. 30, 1807; was educated at Harvard and Yale; studied law with Daniel Webster, and was admitted to the bar in 1833. He enlisted as a volunteer in the Union army early in 1861; was appointed a Brigadier-General in August; and became military governor of the District of Columbia in March, 1862. He was engaged in the battles of Fredericksburg, Chancellorsville, Gettysburg, and the Wilderness as the commander of a division, and was killed in the last named battle, May 6, 1864.

**Wady-Halfa,** a second class district in the Sudan, 1 mile from the second cataract of the Nile. Also a town in the Sudan, on the W. bank of the Nile, where there are two ancient temples.

**Waechter, Karl Georg von** (ve*h*'ter), a German jurist; born in Marbach, Dec. 24, 1797; was the author of: "Disquisitions on Criminal Law" (1835); "The German Common Law, Especially Criminal Law" (1844); a commentary on the "Pandects" of the Justinian Code (2 parts, 1880–1881). He died in Connewitz near Leipsic, Jan. 15, 1880.

**Waechter, Oskar von,** a German jurist and publicist; born in Tübingen, April 29, 1825. He wrote: "Copyright Systematically Laid Down According to the German Common Law" (1875); "Copyright in Works of Plastic Art, Photographs, etc." (1877); "Encyclopædia of the Laws of Exchange" (1879–1880); "Vehmgericht and Witchcraft Trials" (1882); "Old Gold in German Proverbs" (1883); "Johann Jakob Moser" (1885).

**Wafer,** a name given to the small piece of unleavened bread used in the sacrifice of the Mass, and called after consecration the Host. A bitter controversy arose between the Eastern and Western Churches when the use of unleavened bread was introduced into the latter in the 11th century. At the same time, according to some, the bread was formed in the shape of a penny, to represent the pence for which our Saviour was betrayed. Most likely it was connected with the development of the doctrine of Transubstantiation in the 11th and 12th centuries. At this time every means was adopted to prevent profanation. Thus the communion of children was discontinued. Anxious solicitude was shown in the administration of the cup to prevent spilling, and the use of the wafer was probably adopted for the same reason as the cup was finally withheld from the laity altogether.

**Wafers,** thin disks of adhesive matter, formerly much used for securing letters, and still in use for attaching papers to each other, for legal seals, etc. Common flour wafers are made by preparing a thin uniform batter of flour and water, pouring the preparation on greased wafer irons, on which it speads to a uniform thin sheet, and exposing it to the heat of a clear charcoal fire till it becomes a hard, dry, thin cake. The cake is allowed to cool, and the wafers are then punched out with sharp cutting punches. They may be colored to any desired tint by mixing the appropriate dye stuff with the batter previous to placing it on the wafer irons. Transparent or gelatine wafers are composed of thin sheets of colored gelatine, to which a small proportion of sugar has been added to facili-

tate its solution, such cakes being similarly punched into small disks.

**Wagel,** in ornithology, according to Willughby the great black-backed gull (*Larus marinus*). Willughby was followed by Pennant, who afterward changed his opinion, and in his "Arctic Zoölogy" describes the wagel as the young of the herring gull, the Linnæan *Larus fuscus*, the lesser black-backed gull of modern ornithology.

**Wagenaar, Jan,** a Dutch historian; born in Amsterdam, Holland, Oct. 3, 1709. His best-known work is "History of the Fatherland" (21 vols. 1749–1760): the work reaches down to the year 1751. He wrote also: "Description of the United Provinces of the Netherlands" (12 vols. 1739); "Description of Amsterdam" (3 vols. 1760–1767). He died in Amsterdam, in March, 1773.

**Wagener, Hermann,** a German writer on political subjects; born in Segelitz near Neu-Ruppin, Germany, March 8, 1815. He edited a "Lexicon of the State and Society" (23 vols. 1858–1867); and wrote "The Policy of Frederick William IV." (1883); "My Memoirs of the Periods between 1848 and 1866, and from 1873 till Now" (1884). He died in Berlin, Germany, April 22, 1889.

**Wager,** in law, a promise to give money or money's worth on the happening of an uncertain event. Every contract of insurance is in the nature of a wager, but such contracts are permitted, because they serve useful purposes. Sporting wagers were enforceable at common law unless they were of an indecent or otherwise improper character; thus, a wager on the life of Napoleon was held void, as tending to weaken patriotism and to encourage the assassination of a foreign sovereign. In England, by an act of 1845, all agreements by way of wagering are rendered null and void as between the parties; but the enactment does not apply to any subscription for a prize to be awarded to the winner in any lawful sport. Where a person employs an agent to bet for him, or to enter into transactions contrary to Leeman's act (passed to prevent gambling in shares) no action can be brought on the bet or bargain made by the agent; but if the agent pays, the principal remains liable to indemnify him. These rules apply to all wagers; but there are certain forms of agreement which are not only void but illegal. Acts were passed in 1665 and 1710 to discourage betting on games, and an act of 1835 provides that any security given for a gambling debt shall be void, and that money paid to the holder of such security may be recovered by action. As the loser of a bet cannot be legally compelled to pay, the debt is only what is called a debt of honor; but sporting men are usually more scrupulous in paying such debts than in the meeting the claims of their lawful creditors. By the criminal law penalties are imposed on persons who keep or use houses for betting purposes, and magistrates may authorize the police to break into such houses and arrest persons found therein. Persons who win money by cheating at cards, etc., are liable to be indicted for obtaining money by false pretenses; persons playing or betting in the street may be punished as rogues and vagabonds. In the law of Scotland wagers are treated as *pacta illicita*, and debts incurred by wager are not enforced. In the United States gaming contracts are in most States void, and money paid or property delivered on such considerations may generally be recovered. See GAMBLING.

**Wages,** the payment for work done or services performed; the price paid for labor; the return made or compensation paid to those employed to perform any kind of labor or service by their employers; hire, pay, recompense, meed. The rate of wages is determined by the ratio which the capital, for the productive use of which labor is sought, bears to the number of laborers seeking that kind of employment. When the capital increases more rapidly than the laboring population of the country, wages rise; when it increases more slowly, they fall. But in the United States and most countries, the rise of wages produces an increase in the number of marriages, and in due time, of population, with the result of ultimately causing wages again to fall. All attempts to fix wages by law are inoperative and mischievous. The effort was made, in England, in the reign of Edward III. (1350), on the part of capitalists, after the black death, in 1346, had swept away so large a part of the population, both in Great Britain and the continent, that wages naturally and greatly rose. If, on the other hand, the capitalists were required by law to give higher wages than the natural law of supply and demand fixed, his motive for continuing to carry on his business would become less potent, or might wholly cease, and ultimate injury be done to those whom it was sought to benefit. Wages in ordinary language is restricted to the payment for mechanical or muscular labor, and especially to that which is ordinarily paid for at short, stated intervals, as daily, weekly, fortnightly, etc., to workmen. Strictly speaking, however, the term wages comprehends as well the pay of officers, the fees of barristers, medical men, etc., the salary of clerks, the stipends of clergymen, as the remuneration for mechanical labor.

**Wagnalls, Mabel,** an American pianist and author; born in Kansas City, Mo.,

April 20, 1871; was privately educated till 1885, when she studied music in Paris, Vienna, and Berlin. She made her first appearance in New York city, Jan. 11, 1891, with the Theodore Thomas orchestra, and in the following year played with Anton Seidl's orchestra. She was the author of "Miserere: A Musical Story" (1892); "Stars of the Opera" (1898); "Selma, the Soprano" (1898); "Stories of the Operas"; "The Mystery of Karina Donimirska"; "Seven Ages of a Musician"; "Marietta Holley as Her Friends Know Her"; etc.

**Wagner, Adolf,** a German political economist; born in Erlangen, Germany, March 25, 1835; son of Rudolf Wagner. The more important of his writings are: "Contributions to the Study of Banking" (1857); "Abolition of Private Land-ownership" (1870); "Law in the Apparently Arbitrary Doings of Man" (1864); "Text-Book of Political Economy," written in collaboration with other economists (vol i. 1876; vol vii. "Finance" 1880), in which he upholds socialistic views, favoring State ownership of railways; "The Science of Finance and State Socialist" (1887); "My Conflict with the Baron von Stumm-Halberg" (1895), the last two in defense of socialism.

**Wagner, Arthur Lockwood,** an American military officer; born in Ottawa, Ill., March 16, 1853; was graduated at the United States Military Academy in 1875; engaged in the Sioux campaigns in 1876–1877 and the Ute campaigns in 1880–1881; served in various government schools as instructor of military science and tactics in 1882–1897; was promoted lieutenant-colonel in 1896; and in 1897 was placed in charge of the military information division of the War Department at Washington, D. C. At the outbreak of the American-Spanish War he was assigned to the staff of Major-General Miles and soon afterward was detached for duty on the staff of Major-General Lawton, under whom he served in the campaign in Cuba. After the war he was sent to the Philippines, and was placed in command of the Department of Southern Luzon, in April, 1900. He died June 17, 1905, two days before he was to have been made a Brigadier-General.

**Wagner, Ernst,** a German novelist; born in Rossdorf, Germany, Feb. 2, 1769. Among his more successful novels are: "Willibald's Views of Life" (1804); "The Traveling Painters" (1806); "Isidora" (1814). He wrote also "Journeys from Abroad Homeward" (1808). He died in Meiningen, Germany, Feb. 25, 1812.

**Wagner, Heinrich Leopold,** a German poet; born in Strassburg, Germany, Feb. 19, 1747. He wrote: "Prometheus and Deucalion" (1775), a farce ridiculing the critics who carped at Goethe's "Werther"; "Voltaire on the Eve of his Apotheosis," a dramatic satire, (1778); "Repentance After the Act," a drama (1775); "The Child-Murderess," a tragedy (1779). He died in Frankfort on the Main, March 4, 1779.

**Wagner, Hermann,** a German statistician; born in Erlangen, Germany, June 23, 1840; son of Rudolf Wagner. Among his works are: "The Earth's Population"; "Wall Map of Germany" (1879); "Text-Book of Geography" (2 vols. 1894–1895); "Methodical School Atlas" (6th ed. 1895).

**Wagner, Moritz,** a German naturalist; born in Beyrout, Germany, Oct. 3, 1813. He traveled in Algeria, the coast lands of the Black Sea, the Caucasus, Armenia, Kurdistan, Persia, North and Central America, and the West Indies. Among his writings are: "Travels in the Regency of Algiers" (3 vols. 1841); "The Caucasus and the Land of the Cossacks" (2 vols. 1847); "Journey to Colchis" (1850); "Journey to Ararat and the Armenian Highlands" (1848); "Travels in Persia and in the Land of the Kurds" (2 vols. 1851); "Scientific Travels in Tropical America" (1870); "The Darwinian Theory, and the Law of Migration of Organisms" (1868). He died in Munich, May 30, 1887.

**Wagner, Rudolf,** a German physiologist; born in Beyrout, Germany June 30, 1805. In 1840 he became Professor of Physiology at Gottingen. Among his writings are: "Text-Book of Comparative Anatomy" (1834); "Text-Book of Physiology" (1839); "Hand-Dictionary of Physiology" (4 vols. 1842–1853); "Creation of Man and Soul Substance" (1854); "Of Knowledge and Belief, with Special Reference to the Future of the Soul" (1854); "The Struggle Over the Soul" (1857); "Zoölogico-Anthropological Researches" (1861); "Preliminary Studies toward a Scientific Morphology and Physiology of the Human Brain as an Organ of Soul" (two parts, 1860–1862). He died in Göttingen, Germany, May 13, 1864.

**Wagner, (Wilhelm) Richard,** a German operatic composer; born in Leipsic, May 22, 1813. In 1834-1836 he was conductor at Magdeburg, and after similar engagements (1836-1839) in Königsberg and Riga, he went to Paris, where he remained from 1839 to 1842. Here he composed or completed his "Rienzi" and "Der fliegende Holländer" (Flying Dutchman). "Rienzi" obtained for him the post of assistant conductor (with Reissiger) at Dresden. His "Tannhäuser" was produced there in 1845. He spent the season of 1855 in London as conductor of the Philharmonic Society's concerts. In all his operas the words of the libretto are of his own composition, and far superior, from

the poetic standpoint, to the majority of works intended for such use. They are treated in a declamatory style, supported by most original harmonies and instrumentation in accordance with their dramatic significance. He advanced the importance of the orchestral accompaniment till it became almost the prime factor in the performance of his works. He was acknowledged supreme master of instrumental effects. It must be admitted, however, that, in his later works especially, his scoring is not unfrequently cruel to the human voice. Wagner was a musical revolutionist and reformer in many ways affecting the opera. As with reformers and iconoclasts in other spheres and times, his methods and theories will doubtless be modified by the future. Meantime he may safely be ranked as the greatest musician who has arisen since Beethoven, and his probable influence

RICHARD WAGNER.

on future operatic compositions can scarcely be overestimated. The following is a list with dates of first performances of his remaining dramatic works: "Lohengrin" (1850); "Tristan und Isolde" (1865); "Die Meistersinger" (1868); "Das Rheingold" (1869); "Die Walküre" (1870); "Siegfried" (1876); "Götterdämmerung" (Twilight of the Gods) (1876); "Parsifal" (1882). Of the above "Die Walküre," "Siegfried," and "Götterdämmerung" together constitute Wagner's greatest work, the "Trilogie," three chapters of one story, each for a separate evening. "Das Rheingold" is the preface to these three, wherein occur the events whose far-reaching consequences are developed in the subsequent evenings. The four works constitute the "Ring of the Nibelungen." Wagner's ambition was to produce a distinctively national (German) music-drama; hence his choice and adaptation of scenes from the almost prehistoric epic of Germany—the "Nibelungenlied," the German "Iliad." He died in Venice, Feb. 13, 1883.

**Wagner, Fort,** one of the defenses of Charleston, S. C.; erected on Morris Island. It was captured by the Union forces under Gen. Q. A. Gillmore, Sept. 6, 1863.

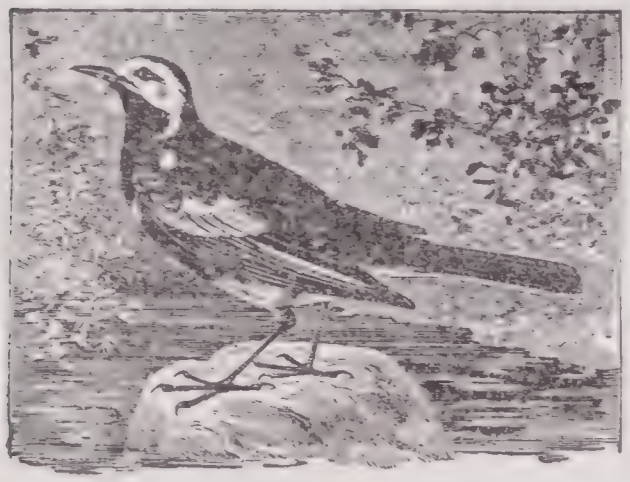
**Wagon,** in ordinary language, a four-wheeled vehicle for the transport of goods, freight and produce. The ordinary wagon is a strong, heavy vehicle, drawn by two (or sometimes more) horses yoked abreast. The fore wheels are smaller than the hind wheels, and their axle is swiveled to the body of the vehicle, so as to facilitate turning. Most wagons are supplied with strong springs, on account of the weight of the vehicle, and to make up for the absence of the steadying power of the horses, who expend their force in pulling only, the weight being distributed over the four wheels. A vehicle on four wheels of equal diameter is of lighter draught tnan one in which the fore wheels are smaller than the hind wheels unless the load is distributed on the wheels in proportion to their diameter. Common examples of the wagon are the brewer's dray, the agricultural wain, and the railway truck. Carriers' wagons are generally provided with wooden bows, over which can be stretched a covering of heavy canvas or other material, so as to protect the goods carried from rain, etc. The ends of the bows are inserted in staples on each side of the vehicles, so that cover and bows can be removed when not required.

Wagon, in goldbeating, a tool having four edges of cane mounted in a frame, and used to trim the edges of gold-leaf to a size for a book; that is, about 3¼ inches on a side. The cane is used in preference to steel, as the gold does not adhere to it.

**Wagram,** a village of Lower Austria; on the left bank of the Rossbach; 12 miles N. E. of Vienna; famous for the great battle in 1809 between the French under Napoleon and the Austrians under the Archduke Charles, each about 15,000 strong. The battle was well contested, but the result gave Napoleon a decisive victory, which was followed up by an armistice and the treaty of Schönbrunn (Oct. 14).

**Wagtail,** a name of birds included in the family of the warblers, and so termed from their habit of jerking their long tails when running or perching. They inhabit meadow lands and pastures, frequent water pools and streams, are agile runners, and have a rapid flight. The food consists of insects. Their nests, built on the ground, contain from four to six eggs. These birds belong to both Old and New Worlds, and migrate S. in winter; but the pied wagtail (*Motacilla Yarrellii*) is a permanent resident in Great Britain. It is almost wholly black on the upper parts; the under parts

are grayish white. Other representative varieties, distributed principally over the European continent and the East, are the white



PIED WAGTAIL.

wagtail (*M. alba*); the gray wagtail (*M. campestris* or *Boarula*); and the yellow or Ray's wagtail (*M. sulphurea* or *Budytes Rayi*).

**Wahabi** or **Wahabee,** in the plural in Mohammedanism, a sect founded by Abdul Wahhab, born toward the end of the 17th century, near Der'aiyeh, the capital of Nejd, in Arabia. During the Saracen period the Mohammedan sacred places were in Arab custody. When the Saracen was succeeded by the Turkish power they passed over into Turkish keeping. It is obligatory on every Mussulman who can afford the expense, to make a pilgrimage to Mecca at least once in his life. The Arabs were greatly scandalized by the moral laxity of some of the pilgrims, and it became painfully apparent that even the best of them had largely departed from the purity of the faith, according divine honors to Mohammed, elevating tradition to the same level as revealed scripture, and quietly ignoring any precept of the Koran which required self-denial for its performance. Abdul Wahhab felt it a duty to make a determined effort to restore Mohammedanism to its pristine purity, and the most earnest Moslems gradually became his followers. Converting to his views Mohammed Ibu Saud, the powerful Sheikh of Der'aiyeh, whose daughter he married, he induced his father-in-law to draw his sword for the establishment of a pure Mohammedan theocracy.

The Bedouins flocked to his standard; the towns of Arabia, less inclined to adopt the new faith, had to be conquered. The Pasha of Bagdad, A. D. 1748 and 1749, somewhat retarded, but did not permanently arrest their progress. In A. D. 1765 (1172 of the Hegira) the father-in-law died, and on June 14, 1787 (A. H. 1206), the revivalist or reformer. The former was succeeded by his son, Abdul-Aziz. In 1797 the Wahabees pillaged the town and tomb of Husein: in 1803 they captured Mecca, and in 1804 Medina, where they plundered the tomb of Mohammed himself. By this time Abdul-Aziz had been succeeded by his son Saud, by whose orders the Khootba (public prayer) was no longer allowed to be offered in the name of the Sultan. With the exception of the territory subject to the Imam of Muscat, all Arabia now submitted to the Wahabees. They also captured some Arabic towns on the coast of Persia, and Wahabee pirates infested the Persian Gulf. In 1809 these pirates were severely punished by the British, in conjunction with the Imam of Muscat. The same year Mehemet Ali, Pasha of Egypt, prepared to attack them. In 1812 he took Medina, and in 1813 Mecca. In 1816 Ibrahim Pasha, the son of Mehemet Ali, assumed the command of the Egyptian troops and entering Arabia, took Der'aiyeh in 1818, and capturing Abdullah, son and successor of Saud, sent him to Constantinople, where he was beheaded. In 1827, 1834, 1838, and 1839 the Wahabees attempted to excite insurrections, and required continual vigilance from Egypt. In 1862 and 1863 Palgrave found them numerous in Arabia. The Wahabee movement is not now confined to Arabia; it has spread throughout the Mohammedan world, and though quiescent at present, still possesses vigorous life, and will doubtless again from time to time break forth. Many adherents of the sect are believed to exist in India, Patna being considered one of their strongholds.

**Wahl, William Henry,** an American scientist; born in Philadelphia, Pa., Dec. 14, 1848; was educated at public schools and graduated at Dickinson College in 1867; studied also at the University of Heidelberg, Germany, and afterward pursued special studies in mineralogy, geology, and chemistry; was Professor of Physics and Physical Geography at the Central High School in Philadelphia, in 1873–1874. He engaged in scientific journalism in 1876, and did editorial work on various papers till 1882, when he was made editor of the "Journal" of the Franklin Institute. His publications include "Galvano-plastic Manipulations" (1883); "Techno-chemical Receipt Book" (1885, with William T. Brannt); "Historical Sketch of the Franklin Institute" (1894); "Report on Petroleums as to their Safety and Danger"; etc. He died in 1909.

**Wahlenbergia** (named after George Wahlenberg, M. D., author of the "Flora of Japan.") In botany, an old genus of *Campanulaceæ*, reduced by Sir. J. Hooker to a sub-genus of *Campanula*. *W. hederacea* is now *Campanula hederacea*. The flowers of *W. graminiflora* are used by the mountaineers of Southern Europe for epilepsy, and *Y. linarioides* in Chile for pains in the bowels.

**Wahlstatt, Battle of,** or BATTLE OF LIEGNITZ, an engagement fought April 9, 1241, between Duke Henry II., of Silesia, and the Mongols, at Wahlstatt, 4 miles S. E. of Liegnitz. The Mongols were victorious. It was at the same place Aug. 26, 1813, that the French were defeated by the Prussians under Blücher, who thence derived his title of Prince of Wahlstatt.

**Wahoo,** an ornamental shrub, often called burning bush or spindle tree. The name is also given to the winged elm (*ulmus alata*), a small tree of the S. and W. parts of the United States, the hard and close-grained wood of which is used for the hubs of wheels, etc.

**Wahrmund, Adolf,** a German Orientalist; born in Wiesbaden, Germany, June 10, 1827. His principal works are: "Hand-Dictionary of the Arabic and German Languages" (3 vols. 1874–1877); "Poems" (1880); Babylonianism, Judaism, and Christianism" (1882); "Practical Manual of the Osmanli-Turkish Language" (2d ed. 1885); "The Christian School and Judaism" (1885); "Practical Manual of Modern Arabic" (3d. ed 1886); "The Law of Nomadism" (1887); "The War of Civilization between Asia and Europe" (1887); "Monsieur Jourdan, the Paris Botanist, in the Kara-Bagh: A Comedy in Modern Persian" (1889); "Abhâsa: A Tragedy" (1890).

**Wahsatch Mountains,** a long range in Utah which forms the E. boundary of the Great Basin, extending from the N. border of Utah S., through the middle of the State, nearly to the Colorado river. The highest peaks are about 11,500 feet high, on the sides of which deep and picturesque cañons occur. Silver is found in this range. The highest peak is Mount Nebo.

**Waiblinger, Wilhelm Friedrich,** a German author; born in Heilbronn, Germany, Nov. 21, 1804. His tales, "Four Stories from Greece" (1821), and "Three Days in the Nether World" (1826); and his "Poems," were received with extraordinary favor. He wrote also: "Pocket Book of Italy and Greece" (1829); "The Britons in Rome,", a humorous story (1844); "Poems from Italy." He died in Rome, Jan. 17, 1830.

**Waigatch.** See VAIGATCH.

**Waikato,** the principal river of the North Island of New Zealand; flows first into Lake Taupo, and then out of it N. to Manakan harbor, with a total course of 170 miles. Between the Upper Waikato, Lake Taupo, Mount Ruapehu, and the W. coast lies the mountainous and picturesque "King Country," occupied mainly by Maoris under their king, who till 1884 resolutely opposed the survey or settlement by Europeans of the lands within their *aukati* or frontier.

**Wainwright, Jonathan Mayhew,** an American clergyman; born of American parents in Liverpool, England, Feb. 24, 1793; was graduated at Harvard College in 1812; studied theology and was ordained in the Protestant Episcopal Church in 1818; settled in New York city in 1819; and was there rector of Grace Church in 1821–1834. Three years later he was made assistant in charge of St. John's Chapel, and remained there till November, 1852, when he was consecrated provisional bishop of New York. He was one of the founders of the University of New York, and was deemed one of the most eloquent pulpit orators of his time. His publications include "Four Sermons on Religious Education" (1829); "Lessons on the Church" (1835; "The Pathway and Abiding Places of Our Lord, illustrated in the Journal of a Tour through the Land of Promise" (1851); "The Land of Bondage: being the Journal of a Tour in Egypt" (1852); etc. He died in New York city, Sept. 21, 1854.

**Wainewright, Thomas Griffiths,** an English essayist, forger, and poisoner; born in Chiswick in October, 1794. Left an orphan, he was brought up at Turnham Green by his grandfather, Dr. Ralph Griffiths (1720–1803), and was educated under Charles Burney. He had held a commission in the Guards, when, about 1820 or earlier, he took to writing art criticisms and miscellaneous articles for the periodicals, especially the "London Magazine." He married on $1,000 a year, and, soon outrunning his means, first committed a forgery (1824), and then poisoned with strychnine his uncle (1829), his mother-in-law (1830), a sister-in-law (1830), and a Norfolk acquaintance at Boulogne (1831). The sister-in-law (Wainewright's wife was an accomplice in her murder) had been fraudulently insured for $90,000, but two actions to enforce payment failed; and Wainewright, venturing back from France to London in 1837, was arrested for his old forgery, and sentenced to life transportation. Even in Newgate he bragged of still holding "the position of a gentleman," and in Van Diemen's Land canted about "Art and the Ideal." There he painted portraits, ate opium, and at last died of apoplexy in Hobart Town hospital about 1852. The "kind, light-hearted Wainewright" of Charles Lamb (1823) is depicted by "Barry Cornwall" as short and fattish, "with mincing steps and tremulous words, his hair curled and full of unguents, and his cheeks, painted like those of a demirep," a collector of richly-bound works on occultism and poisoning. He is the "Varney" of Lytton's "Lucretia" (1846), and the "Slinkton" of Dicken's "Hunted Down" (1860).

**Wainscot,** the name given to panelled boards (usually oak or chestnut) employed

to line the internal walls of an apartment. Wainscoting of oak was commonly used for interior linings in Elizabethan and Stuart times.

**Wainscot Moth,** the *Leucania pallens*, a very common night moth, having the fore wings pale ocher-yellow, with the veins paler, and three faint dark dots; hind wings whitish or very pale gray. Expansion of wings an inch and a quarter. The caterpillar feeds in spring on various grasses. The wainscot moths frequent marshy localities, and as a rule measure about an inch and a half across the wings.

**Wainwright, Richard,** an American naval officer; born in Washington, D. C., Dec. 17, 1849; was graduated at the United States Naval Academy in 1868; promoted lieutenant in 1873, lieutenant-commander in 1884, and commander in 1889; served on various stations and duties and was the executive officer on the battleship "Maine" when she was blown up in Havana harbor in 1898. He commanded the converted yacht "Gloucester" in the war with Spain; took part in the destruction of Cervera's squadron, July 3, 1898; destroyed the Spanish torpedo boats "Furor" and "Pluton" during the fight; was appointed superintendent of the United States Naval Academy in 1900; promoted rear-admiral in 1908.

**Wait,** one of a body of minstrels or musical watchmen attached to the households of kings and other great persons, who paraded an assigned district sounding the hours at night. Many cities and towns, both English and foreign, encouraged and licensed their waits, Exeter among other places having a regular company as early as the year 1400. As a plural, the word was sometimes used to describe those who acted as the town musicians, but who did not do duty as watchmen, and any company of performers when employed as serenaders. The instruments used were a species of hautboys, called also shawms, and from their use "waits." Also one of a band of persons who promenade the streets during the night and early morning about Christmas or New Year, performing music appropriate to the season.

**Waite, Charles Burlingame,** an American author; born in Wayne co., N. Y., Jan. 29, 1824; was admitted to the bar in 1847; settled in Chicago and practised there till 1862; was associate justice of the Supreme Court of Utah in 1862–1865 and district attorney for Idaho in 1865–1866. He then returned to Chicago and devoted himself to literary work. His publications include "History of the Christian Religion to the Year A. D. 200" (1881); "Herbert Spencer and His Critics" (1900); "Jesus the Essene"; "A Conspiracy Against the Republic" (1889); etc. He died March 25, 1909.

**Waite, Morrison Remich,** an American jurist; born in Lyme, Conn., Nov. 29, 1816; was graduated at Yale University in 1837; studied law and practised in Ohio; member of the Ohio legislature 1849–1850; in 1871 was appointed one of the attorneys to represent the United States before the tribunal of arbitration at Geneva; nominated by President Grant to be chief justice of the United States Supreme Court in 1874, and was unanimously confirmed by the Senate. He died in Washington, D. C., March 23, 1888.

**Waitz, Georg,** a German historian; born in Flensburg, Germany, Oct. 9, 1813. He became professer at Göttingen, 1849. Among his very numerous writings are: "History of the Formation of Germany" (8 vols. 1843–1878; revised ed. 1893), his greatest work. "The Life and Teaching of Ulfilas" (1840); "Researches in German History" (1862); "German Emperors from Charlemagne to Maximilian" (1872). He died in Berlin, May 24, 1886.

**Waitz, Theodor,** a German psychologist; born in Gotha, Germany, March 17, 1821. His more notable works are: An edition of Aristotle's "Organon" (2 vols 1844–1846); "Principles of Psychology" (1846); "Text-Book of Psychology" (1849); "Anthropology of Savage Peoples" (6 vols. 1859–1872), his greatest work; "The North American Indians" (1865). He died in Marburg, Germany, May 21, 1864.

**Waitzen,** a town of Hungary, comitat of Pest, on the Danube; 23 miles N. of Pest. It is an episcopal see; has a cathedral built in 1761–1777 on the model of St. Peter's at Rome; four other Catholic churches and one Protestant, deaf and dumb institute, bishop's palace, with classical and mediæval art treasures, and a prison (1857) in Gothic style. Waitzen carries on an important trade in wine and cattle. The town has been the scene of various battles between Hungarians and Turks, Hungarians and Austrians, and Hungarians and Russians, the most celebrated of which was that of April 10, 1849.

**Wakatipu,** a picturesque lake in the South Island of New Zealand; area, 112 acres. Queenstown and Glenorchy, on the borders of the lake, are favorite tourist resorts, on account of the magnificent mountain scenery in the vicinity.

**Wake,** a term corresponding originally to vigil, and applied to a festival held on the anniversary of the day on which the parish church was consecrated and dedicated to a saint. A *lyke* or *lich wake* (Anglo-Saxon, *lìc*, a corpse) is the watching of a

dead body by night by the relatives and friends of the deceased. The practice, once general, is now confined to the lower Irish classes, and frequently accompanied by scenes much out of keeping with the sad occasion.

**Wake, Charles Staniland,** an English anthropologist; born in England, March 22, 1835; was educated at Hull College, England; was director of the Anthropological Society of Great Britain and Ireland; became identified with scientific societies in the United States and Great Britain; settled in Chicago where he became connected with the Field Columbian Museum. He was the designer of the system of color and musical-tone relations. His publications include "Chapters on Man" (1862); "The Evolution of Morality" (2 vols. 1878); "The Origin and Significance of the Great Pyramids" (1882); "Serpent Worship and Other Essays" (1888); "The Development of Marriage and Kinship" (1889); and "The Geometry of Science." He also edited the "Memoirs of the Congress of Anthropology."

**Wake, William,** an English clergyman; born in Blandford, Dorsetshire, in 1657; studied at Christ Church, Oxford, and was successively preacher to Gray's Inn, rector of St. James's, Westminster, Dean of Exeter (1701), Bishop of Lincoln (1705), and primate (1716). Of great learning and industry, he bequeathed his name to posterity in the "Genuine Epistles of the Apostolic Fathers" (1693). He maintains the authenticity of them all; but though his preliminary dissertation may be antiquated, the translations are still excellent. He died in Lambeth, Jan. 24, 1737.

**Wakefield,** the capital of the West Riding of Yorkshire, England, on the Calder at a convergence of railways, 9 miles S. S. E. of Leeds, 27 S. S. W. of York, and 19 N. W. of Doncaster. In 1888 it was constituted the seat of a bishopric — its cathedral, the fine Perpendicular parish church, which, enlarged and reconsecrated in 1329, and again enlarged about 1470, was restored in 1857–1886 from designs by Sir G. G. Scott at a cost of $150,000, and has a tower and spire 227 feet high. On the eight-arch bridge over the Calder is an interesting chapel founded in 1357 by the townsmen of Wakefield, a building in the beautiful flowing Decorated style; it also was restored in 1847. At the grammar school, chartered in 1591, and removed to new buildings on a different site in 1855, were educated Dr. Radcliffe, Archbishop Potter, the Benedictine Cressy, and Bentley, the first two of whom were natives. The town hall, French Renaissance in style, was erected in 1880 at a cost of about $360,000; and other buildings are the corn exchange; fine art institute, Clayton hospital, and lunatic asylum. Though not the great "clothing town" it was formerly, Wakefield still has considerable manufactures of woolens, worsteds, and hosiery, as also of agricultural implements, machinery, etc. The chief event in the history of Wakefield is the Yorkist defeat in the Wars of the Roses, on Dec. 31, 1460. Pop. (1901) 41,544.

**Wakefield, Edward Gibbon,** an English colonist; born in London, March 20, 1796; was in 1826 imprisoned for abducting a young lady and marrying her at Gretna Green. During his imprisonment he studied colonial questions with zeal, and after his liberation assisted in the colonization of South Australia. He was private secretary to Lord Durham in Canada in 1838, but is best known for his services to New Zealand colonization as managing director of the New Zealand Association. He was one of the founders of the High Church colony of Canterbury, where he died May 16, 1862.

**Wakefield, Gilbert,** an English clergyman; born in Nottingham, England, Feb. 22, 1756; was educated at Jesus College, Cambridge, of which he became fellow. He took orders, but renounced the Anglican communion, labored as classical tutor in dissenting academies at Warrington and Hackney, lay two years in Dorchester jail for a so-called seditious libel in answer to Bishop Watson, for which his political friends consoled him with a gift of $25,000. He published editions of Bion and Moschus, Vergil, Horace, and Lucretius; "Christian Writers of the Three First Centuries on the Person of Christ" (1784), left unfinished; "Inquiry into the Expediency and Propriety of Social Worship" (1791), the necessity for which he denied; "An Examination of Paine's Age of Reason" (1794); and "Silva Critica," a collection intended to illustrate the Scriptures from the stores of profane learning (1789–1795). He died in London, Sept. 9, 1801.

**Wake Forest College,** an educational institution in Wake Forest, N. C.; founded in 1833 under the auspices of the Baptist Church; reported at the close of 1901: Professors and instructors, 16; students, 307; volumes in the library, 15,000; productive funds, $210,000; grounds and buildings valued at $100,000; benefactions, $1,750; income, $35,116; number of graduates, 732; president, C. E. Taylor, D. D., LL. D.

**Wakeman, Antoinette Van Hoesin,** an American journalist; born in Cortland co., N. Y., Dec. 4, 1854; was educated at the Woman's College, Evanston, Ill.; was a correspondent and writer for the St. Paul "Pioneer Press," the Minneapolis "Journal"; and the Chicago "Times" and "Tribune"; served for four years on the

editorial staff of the Chicago "Evening Post." During the World's Columbian Exposition she was chairman of the committee on program for the Woman's Press Auxiliary Congress. Her publications include "Scientific Sewing and Garment Cutting" (1898); "Questions of Conscience" (1900); "How to be Attractive and Successful" (1900); etc.

**Wakemanites,** a small party of fanatics existing at New Haven, Conn., in 1855, who regarded an old and apparently insane woman, named Rhoda Wakeman, as a divinely commissioned prophetess, who had been raised from the dead. At her bidding, some of her followers murdered a farmer, Justus Matthews, who, she said, was possessed by an evil spirit. The unfortunate man willingly submitted to the sentence pronounced by the pseudo-prophetess, but the extinction of the sect followed as a matter of course.

**Walburga.** See WALPURGA.

**Walcheren,** an island of Holland; province of Zeeland, at the mouth of the Scheldt. It is level, below high-water mark, very fertile, populous, and prosperous. It contains the thriving towns of Flushing, Middelburg (capital), and Veere. On July 13, 1869, the British expedition under Lord Chatham (elder brother of Pitt) landed near Veere, and took it, Middelburg, and Flushing, but had to retire the December following, after losing 7,000 men by marsh fever.

**Walcheren Fever,** a remittent fever which caused the death of about 7,000 British troops when an army encamped in the marshes of Walcheren, Holland, in 1809.

**Walchia** (named after J. E. E. Walch (1725–1778), a German theologian and naturalist), a genus of coniferous trees akin to cypress. It has short leaves. One species is in the Permian, one in the Trias, and one in the Jurassic rocks of England. The best known species is the Permian one, *W. piniformis.*

**Walchowite** (after Walchow, Moravia, where found), a native resin, occurring in yellow translucent to opaque masses in a brown coal; hardness, 1.5–2; sp. gr., 1.0–1.69. Composition: Carbon, 80.41; hydrogen, 10.66; oxygen, 8.93 = 100.

**Walckenaera** (from Walckenaer, author of a work on spiders), a genus of *Theridiidæ*, having the portion of the cephalothorax which bears the eyes more or less elevated. Type *W. acuminata,* a small spider found under stones and on rails in England.

**Walcott, Charles Doolittle,** an American scientist; born in New York city, March 31, 1850; early devoted himself to geological research; became assistant geologist in the United States Geological Survey in 1879; presented the results of his Cambrian researches before the International Geological Congress in London in 1888; was palæontologist in charge of the Palæontological investigations in 1888–1893; director of the geological department in 1893–1894; director of the United States Geological Survey in 1894-1907; honorary curator of the Department of Palæontology from 1892; acting assistant secretary of the Smithsonian Institution in 1897-1898, and secretary from 1907; secretary of the Carnegie Institution, Washington, in 1902-1905; and president of the Washington Academy of Sciences from 1899. His publications include: "The Trilobite"; "Palæontology of the Eureka District"; "The Cambrian Faunas of North America"; and numerous reports and papers on palæontological and geological subjects, etc.

**Walcott, Charles Melton,** an English dramatist; born in London, England, in 1815. Besides being an excellent comedian, he wrote many plays, among which are: "The Course of True Love" (1839); "Washington; or, Valley Forge" (1842); "Edith" (1846); "The Custom of the Country" (1848); "The Haunted Man" (1848); "David Copperfield" (1848); "Hoboken" (1849); "One Cast for Two Suits" (1854); "Hiawatha" (1855); "A Good Fellow" (1857). He wrote the songs, "My Love is a Sailor Boy" and "My Own Little Rose." He died in Philadelphia, Pa., in May, 1868.

**Waldau, Max,** pseudonym of RICHARD GEORG SPILLER VON HAUENSCHILD, a German poet; born in Breslau, Germany, March 24, 1822. He early rose to prominence through his scholarly attainments, but as a poet he has made his name known wherever German poetry is read. "A Fairy Fable," "Leaves in the Wind," and "Rahab: Pictures of Bible Women," are conspicuous among his volumes of verse. "Cordula" is a poem admired for its rich metrical effects. He also wrote "After Nature," a novel that enjoyed quite a run. He died in Tscheidt, Upper Silesia, Jan. 20, 1855.

**Waldeck,** a principality in the W. N. W. of Germany; comprises the former county of Waldeck, girt by the Prussian provinces of Westfalen and Hessen-Nassau, and that of Pyrmont lying apart between Lippe, Hanover, Graunschweig, and Westfalen; area, 433 square miles; pop. (1905) 59,127. Waldeck is among the highest districts between the Rhine and Weser, the greatest elevations being the Hegekopf (2,750 feet), near Stryck, the Ettelsberg (2,703), and Pön (2,519). The country, picturesquely diversified with vale and upland, plain and

forest, is watered by the Weser, Eder, Werbe, Itter, Aar, Diemel, and Twiste. At Neiderwildung are chalybeate springs, and at Pyrmont are famous saline and iron springs. The chief crops are rye, oats, and potatoes. The woods cover 105,142 acres. The principal export is the mineral water of Wildung, which is sent as far as Japan and China. The princely house of Waldeck dates from the 12th century and till the end of the 14th possessed Swalenberg and Sternberg. George Victor (born 1831) negotiated a "Treaty of Accession" in 1867, by which he transmitted the administration to Prussia, himself retaining merely nominal power. The treaty was confirmed in 1878. His son, Friedrich (born 1865), was the reigning prince in 1911.

**Waldeck-Rousseau, Pierre Marie,** a French statesman; born in Rennes, France, Dec. 2, 1846; he studied law and practised in Rennes till 1879, when he was elected to the Chamber of Deputies as a Gambettist. He was Minister of the Interior in the cabinet of 1881–1882, and again during the Ferry administration in 1883–1885. He continued as deputy from Rennes till his election to the Senate in 1889. After the fall of the Dupuy ministry in 1899 he was appointed premier by President Loubet, and under many difficulties formed a new and greatly strengthened ministry. As a lawyer he was engaged as counsel for Count de Lesseps in the Panama case, and was a Dreyfus revisionist. He died Aug. 10, 1904.

**Waldemar I.,** called THE GREAT, King of Denmark; born in 1131, succeeded Eric V. in 1147. His reign was illustrated by expeditions against the pirates of the Baltic, and he compelled Magnus VI., King of Norway, to sign a humiliating treaty. He died in 1181. WALDEMAR II., called The Victorious, younger son of the preceding, succeeded his brother Canute VI., in 1202. He made many warlike expeditions into Sweden, Norway, and Germany, created a powerful navy, and revised the laws of his kingdom. He died in 1241. WALDEMAR III., eldest son of the preceding, was regent from 1219 to 1231. WALDEMAR IV., third son of Christopher II., was in Bavaria at the death of his father in 1333. In 1340–1344 he recovered part of his kingdom by force of arms, and obtained some further successes against Sweden in 1353 and 1357; eventually, however, he was glad to obtain peace by making some sacrifices; he died in 1376.

**Walden, Treadwell,** an American clergyman; born in Walden, N. Y., April 25, 1830; received a collegiate education and was graduated at the General Theological Seminary in 1853; was ordained in the Protestant Episcopal Church in 1856; held pastorates in New Jersey, Pennsylvania, Indiana, Massachusetts, and Minnesota. He also preached in various churches in England. In 1864 he was made a member of the United States Sanitary Commission. His publications include "Story of England in Westminster Hall"; "Lays of a Lifetime" (1856); "The Sunday-School Prayer Book" (1860); "Narrative of Privations and Sufferings of United States Officers and Soldiers in Confederate Prisons" (1864); "Our English Bible and Its Ancestors" (1870); "An Undeveloped Chapter in the Life of Christ" (1882); etc.

**Waldenses,** a famous Christian community which originally grew out of an anti-sacerdotal movement originated by Peter Waldo, of Lyons, France, in the second half of the 12th century. A rich merchant, pious and unlearned, he caused the New Testament and a collection of extracts from the Fathers to be translated into Romaunt, and, naturally failing to find the apostolic simplicity in the ecclesiastical condition of the time, sold his movable goods for the support of the poor, and devoted himself to preaching the truth to the people by the wayside. Everywhere he found eager listeners, and was followed by groups of simple and earnest persons of both sexes who did their best, even to their dress, to carry out the apostolic ideal, loving to bear the name of the Poor Men of Lyons. The tenets ascribed to them in the earliest accounts are chiefly that oaths even in a court of justice are not allowable, that homicide is under no circumstances justifiable, that every lie is a mortal sin, that all believers are capable of priestly functions, and that the sacraments are invalidated by uncleanness of life in the officiating priest.

We find at first no special doctrines that could be condemned as heretical, and even in later days, as Mr. Lea points out, the documents of the Inquisition constantly refer to "heresy and Waldensianism," the former meaning Catharism. The Archbishop of Lyons forbade them to preach, but in vain; Pope Alexander III. gave them a modified approval, but Lucius III. anathematized them at Verona in 1184, and Innocent III. at the fourth council of the Lateran in 1215. But it was impossible to compel silence, for the missionary zeal of these sincere enthusiasts was boundless, and their influence quickly grew. Alonso II. of Aragon ordered them to quit his dominions in 1194, and in Southern France they became involved in the common destruction of the Albigenses, though their quarrel with the Church differed from that of the latter in relating to matters of practice rather than of doctrine.

But under persecution their divergences from the Church naturally grew ever the greater, and we find that gradually, though never uniformly, they came to repudiate the invocation of the Virgin and saints,

Waldenses

transubstantiation, and purgatory with all its consequences. Thus the Waldensian martyrs at Strassburg in 1212 made no distinction between laity and priesthood, while at the same time both the French and Lombardian Waldenses held that the Eucharist could be celebrated only by an ordained priest, and it was at that time still the lat ter only who believed it invalid if the priest was living in sin. Yet they themselves maintained a kind of order of preachers (*perfecti*), living in voluntary poverty and celibacy, in contradistinction to the ordinary *credentes*. And by some accounts there was a kind of hierarchy among the *perfecti*, a theory which gains some support from the frequent use of such terms as *majoralis*, *magnus magister*, *major*, and *minor*. Their morality was austere, and we find the very inquisitors acknowledging their chastity, sobriety, truthfulness, and industry. Their crowning offenses were their paramount regard for Scripture and the unresting proselytism of their preachers, who went abroad two by two, ostensibly practising some calling, as pedlers or tinkers, but ceaselessly exhorting the faithful in sequestered places, hearing confessions, and administering absolution. Their principal seats were the slopes and fastnesses of the Cottian Alps, E. in Piedmont, W. in Provence and Dauphiné.

After the Cathari were finally crushed they supplied the chief work that remained to the Inquisition in France. They had grown strong among the poorer class in Languedoc, with schools, a good organization, and missionaries reputed to have skill in medicine. They next spread into Lorraine, Burgundy, Franche Comté, Narbonne, and the mountains of Auvergne. We find Bernard Gui burning them at Toulouse in 1316, and by this time persecution had done its perfect work as well in refining their piety as in completing their estrangement from Rome. Their doctrine of nonresistance made it easy to harry and confiscate their property, yet we find the victims often too poor to pay for the wood that burned them. During the years 1336–1346 especially they were severely harassed; 12 were burned in front of the cathedral at Embrun in 1348. Popes Clement VI. and Urban V. stimulated the zeal of the Inquisition, and we read how the fierce inquisitor, François Borel, burned 150 at Grenoble in one day in 1393. Gregory XI. urged on the unholy work in Provence, Dauphiné, and the Lyonnais, and in 1375 the prisons were crowded with far more prisoners than could be fed, and charity was actually asked for them by the Church.

During the Great Schism they contrived to escape, and after the Council of Constance the Hussites engaged for a time all the energies of the Church. We hear, however. of the persecutions again in 1432 and later years, and by this time, says Mr. Lea, so completely had the Waldenses monopolized the field of misbelief in the public mind of France that sorcery became popularly known as *vauderie*, and witches as *vaudoises*. Sixtus IV. tried to stir up Louis XI. in vain; but Charles VIII. was more docile, and Pope Innocent VIII. was able in 1488 to organize a crusade against them in both Dauphiné and Savoy. The valley of Pragelato, Val Cluson, and Freyssinières were ravaged pitilessly with fire and sword and wholesale confiscations, many *barbes* (pastors) were burned, and in Val Louise the poor fugitives were smoked to death in their caves. Louis XII. stopped the proceedings, with consent of Pope Alexander VI., whose son Cæsar Borgia had just received the duchy of Valentinois. Their remnants continued to cherish their own faith, more or less under disguise of Catholicism, till they finally merged with the Calvinists after the Reformation.

In Italy the Waldenses had found the ground prepared by the Arnaldistæ, or followers of Arnold of Brescia, and Umiliati, and spread rapidly even in Milan, but especially in the valleys of the Cottian Alps, Luserna, Angrogna, San Martino, Perosa. Poor, hard-working laborers as they were, they showed throughout their history examples of constancy and quiet heroism such as the world has seldom seen. The Inquisition destroyed Catharism in Italy; Waldensianism it could not destroy. About 1312 in Luserna and Perosa, we are told, as many as 500 attended their assemblies. Popes John XXII., Urban V., and Gregory XI. urged on the persecution, yet all the terrors of fire and sword and torture could not tear them from their faith. In 1375 many of the wretched fugitives from Pragelato perished in the snow, among them as many as 50 mothers with children at the breast. Again in 1475 a bitter war of extermination began under the Duchess Yolande, regent of Savoy, and another, as has been seen, in 1488 at the instigation of Pope Innocent VIII. During the persecutions in Savoy many had found refuge in Calabria and Apulia, and about 1400 there was a larger emigration, as during the 15th century the Inquisition was virtually extinct in Naples. These outlying settlements were visited every two years by *barbes* journeying under some pretext, the distance between Pignerol and Calabria being counted 25 days' journey by the W. coast.

The Cathari never made much way in Germany, but on the other hand the Waldenses became strong. Some were burned at Strassburg in 1212, and especially in the diocese of Passau in the second half of the same century there was much persecution. Yet by the close of the century they had become very numerous, often succeeding in escaping notice by their quietness and

outward conformity. In 1392 the Archbishop of Mainz persecuted them vigorously, burning 36 at Bingen together. At Steyer in Pomerania, in 1397, over 100 of either sex were burned. Yet they were not extirpated, and remained strong, especially on the confines between Austria and Moravia. In 1467 they united themselves with the famous Bohemian Brethren. The Waldensians on the French side of the Cottian Alps in 1530 opened negotiations with the Swiss and German reformers, and in 1532 a five days' synod at Chanforans in the valley of Angrogne drew up articles of agreement.

The Provence congregations were persecuted pitilessly under Francis I. in 1545, 22 villages being burned, and 4,000 persons massacred, while as many were driven into flight. In Piedmont they defended their rights with such heroism that Emanuel Philibert in 1561 was forced to grant them freedom of worship in the valleys of St. Martin, Perosa, and Luserna. In 1571 they formed the "Union of Valleys" to guard their rights against a government that could not be trusted. From May, 1630, to July, 1631, plague raged in these valleys and carried off over 10,000 — one-half of the whole population. But still more cruel was the persecution, which seldom indeed gave a long respite, and burst out in 1655 with a ferocious brutality that called forth a significant protest from Oliver Cromwell and from Milton one noble sonnet. In 1601 the Duke of Savoy had driven as many as 500 families into exile; again in 1686 Amadeus II. with the help of French troops coerced many through terror into conversion, and drove the recusants into exile, as many as 2,600 to Geneva alone, others to the Palatinate, Hesse, and Nassau. In August, 1689, more than 800 of these exiles returned to their native valleys, suffering incredible sufferings on their way. Under their pastor Henri Arnaud they made a valiant struggle against the French, and were finally added to Savoy by the peace of Utrecht.

The 18th century was not a favorable age for persecution, yet even at its close the Waldenses could hold no office nor real estate, nor have physicians of their own faith. Napoleon allowed their Church a constitution, but this Victor Emmanuel abolished in 1814, though two years later, urged by England and Prussia, he issued a milder edict. Meantime they prospered — Col. John C. Beckwith (1789–1862), who had lost a leg at Waterloo, through reading Dr. Gilly's "Visit to the Valleys of Piedmont" (1823), settled among the people for the last 35 years of his life, marrying a peasant girl, and succeeded in establishing as many as 120 schools. At last in 1848 Charles Albert gave the Waldenses equal political and religious rights, and since that time their progress has been constant if not rapid. In 1889–1890 they had in Italy 44 churches and 53 stations, 58 pastors and evangelists, and a theological school at Florence.

**Walden University,** a coeducational institution in Nashville, Tenn.; founded in 1866 under the auspices of the Methodist Episcopal Church; has productive funds exceeding $35,000; grounds and buildings valued at over $145,000; scientific apparatus, etc., $6,000; volumes in the library, about 5,000; average faculty, 72; average students, 845; ordinary income, about $45,000.

**Waldersee, Alfred Heindrich Carl Ludwig, Count von,** a German military officer; born in Potsdam, Germany, April 8, 1832; entered the army in 1850; served with distinction in the campaign of 1860 and in the Franco-Prussian War; became Major-General in 1876, general in 1880, quartermaster-general in 1881, Lieutenant-General in 1882; succeeded Von Moltke as chief of the general staff of the army in August, 1888. In 1895 he was promoted Field-Marshal, and in 1900 was chosen commander of the allied armies in China. He died March 5, 1904. His wife, MARY, born in New York city, Oct. 3, 1837, was a daughter of David Lee; spent her early years in Paris with her sister Josephine, and there married Prince Frederic of Schleswig-Holstein-Sonderburg-Augustenburg-Noër, in 1864. On the death of her husband in July, 1865, she returned to Paris, where she remained till 1870, when she removed to Würtemburg, Germany. In 1871 she married Count von Waldersee. She was credited with much influence in the German court, and with having brought about the marriage of Emperor William II. with the Princess Augusta Victoria.

**Waldheimite** (after Waldheim, Saxony, where found), an altered mineral, resembling the actinolite variety of hornblende found in serpentine. It contains over 12 per cent. of soda, which suggests a relationship to arfvedsonite.

**Waldis, Burkard** (väl'dis), a German rhyming fabulist; born about 1490. He was a Franciscan friar, but on returning from a pilgrimage to Rome, embraced the doctrines of Luther. He wrote a charming drama in Low German, "The Parable of the Prodigal Son"; translated the Psalter into German verse; and wrote "Æsopus," a collection of about 400 rhymed fables and drolleries. He died about 1557.

**Waldmüller, Robert** (väld'muhl-ler), pseudonym of CHARLES ÉDOUARD DUBOC, a German poet and miscellaneous writer; born in Hamburg, Sept. 17, 1822. His best work is "Village Idylls" (1860). Other works are: "Travel Studies" (1860);

"Sorrow and Joy," a romance (1874); "Brunhild," a drama (1874).

**Waldo, Frank,** an American meteorologist; born in Cincinnati, O., Nov. 4, 1857; was graduated at Marietta College in 1878 and pursued post-graduate studies at Harvard University in 1880–1882 and then spent a year in Europe. Returning to the United States he was instructor of astronomy at Radcliffe College and later of meteorology at the Corcoran School of Science, Columbian University. He then became a junior professor in the United States Signal Service. He was the author of "Modern Meteorology" (1893); "Elementary Meteorology, for Schools and Colleges" (1896); etc.

**Waldo, Samuel Putnam,** an American author; born in Connecticut in 1780. He wrote: "Narrative of a Tour of Observation by President Monroe" (1818); "Memoirs of Andrew Jackson" (1820); "Life of Stephen Decatur" (1821); "Biographical Sketches of Nicholas Biddle, Paul Jones, Edward Preble, and Alexander Murray" (1823). He edited "Journal of the Brig Commerce upon the Western Coast of Africa." He died in Hartford, Conn., March, 1826.

**Waldstein, Charles,** an American educator; born in New York city, March 30, 1856; was educated at Columbia University and graduated at the University of Heidelberg in 1875; was made Professor of Fine Arts at King's College, Cambridge, England, in 1893; served as director of the American School of Classical Studies in Athens in 1889–1895; and was professor there in 1895–1897. He had charge of the excavations of the American Archæological Institute at Eretria, Platæa, Heraion of Argos, etc. He was the author of "Excavations at the Heraion of Argos"; "Balance of Emotion and Intellect"; "Essays on the Art of Phidias"; "The Work of John Ruskin"; "The Study of Art in Universities"; "The Expansion of Western Ideals and the World's Peace"; etc.

***Wales,** a principality in the S. W. of the island of Great Britain, which since Edward I. gives the title of Prince of Wales to the heir-apparent of the British crown; area, 7,442 square miles; pop. (1891) 1,519,000; (1901) 1,720,600. It is divided into 12 counties. As a whole it is very mountainous, particularly in the N., where Snowdon, the culminating point of South Britain, rises to the height of 3,571 feet; and it is intersected by beautiful valleys, traversed by numerous streams, including among others the large river Severn. It is rich in minerals, particularly coal, iron, copper, and even gold, and to these Wales owes its chief wealth. The coal trade is most extensive, and Cardiff is the largest coal port in the world. In 1898 about 24,000,000 tons of coal were produced in Wales. Iron, steel, and copper works are also on a large scale. Besides the mineral industries, there are considerable woolen manufactures, especially of flannel, coarse cloth, and hosiery. The Welsh have many strange customs and peculiar superstitions. They are remarkably fond of poetry and music, and their language is said to be peculiarly adapted to poetical effusions. Their ancient language is, however, falling fast into disuse throughout the principality, more especially the S. part. Family distinction is held in great estimation. The aboriginal Celtic race still inhabits some parts of the country. Llewellyn ap Gryffydd was the last prince who exerted himself for the independence of Wales. In 1282 he was subdued by Edward I., and fell on the field of battle. From that time, Wales has been annexed to the English crown; but the union was not complete till the reign of Henry VIII., when the government and laws were assimilated with those of England.

**Wales, Prince of,** the principal title of the eldest son, or, in the event of his death, the grandson, of the reigning sovereign of England, but not necessarily of the heir-apparent to the crown, *e.g.*, James I., William IV., or Ernst August of Hanover. The last native who held it was Llewelyn ap Gruffyd (1246-82), two years after whose death it was conferred, so runs the story, by Edward I. on his second son, in fulfilment of his promise to the Welsh chieftains that he would give them a prince born in their midst and unable to speak a word of English. Presenting to them the infant Edward of Cærnarvon, he pronounced the words *Eich Dyn* (This is your man), the origin of the motto *Ich dien*, which another tradition refers to the German motto *Ich diene* (I serve) of King John of Bohemia, slain by the Black Prince at Cressy (1346).

To the Princedom of Wales are annexed, in England, the Duchy of Cornwall and Earldom of Chester; in Scotland, the Duchy of Rothesay, Earldom of Carrick, Barony of Renfrew, and Lordship of the Isles, with the titles of Prince and High Steward of Scotland; and in Ireland, the Earldom of Dublin.

On the death of King Edward VII. (May 6, 1910), his eldest son, George Frederick, Prince of Wales, Duke of Cornwall and York, etc., succeeded to the crown, under the title of George V., and on June 22 following he created his eldest son, Edward Albert (born June 23, 1894), Prince of Wales and Earl of Chester. See GEORGE V.

**Walewski, Alexandre Florian Joseph Colonna, Duc de,** a French statesman;

*For Map, see ENGLAND.

born in Walewice, Poland, May 4, 1810; was educated at Geneva, and entered the Polish patriot army, but later retired and devoted himself to literature. He wrote: "A Word on the Question of Algiers" (1837); "The English Alliance" (1838); a comedy, "The School of the World; or, The Coquette Without Knowing It" (1849). He died in Strassburg, Sept. 27, 1868.

**Walfisch Bay,** a body of water on the S. W. coast of Africa, in lat. 22° 50′ S. It possesses a safe anchorage, but is without fresh water, and its shores are barren and desolate in the extreme. Fish are very abundant, and it was formerly a favorite whaling ground, whence its name. Valuable deposits of copper and lead exist some distance inland, but are not yet worked. The climate is almost rainless, and is fairly healthy except in the hot months, when low fever prevails. In 1878 the coast line between the Cunene and Orange rivers, a distance of 720 miles, was annexed to Cape Colony, the British flag being hoisted at Walfisch Bay. The strip of land thus taken possession of is from 13 to 18 miles broad.

**Walford, Lucy Bethia,** an English novelist; born in Portobello, Scotland, April 17, 1845. She contributed to "Blackwood's Magazine" and other periodicals, and wrote: "Mr. Smith" (new ed. 1875); "Pauline" (last ed. 1885); "Cousins" (new ed. 1885); "Troublesome Daughters" (new ed. 1885); "Dick Netherby" (new ed. 1885); "Four Biographies" (Jane Taylor, Elizabeth Fry, Hannah More, and Mary Somerville: 1888); "Her Great Idea, and Other Stories" (1888); "Baby's Grandmother"; "Iva Kildare"; "The Intruders"; etc.

**Walhalla,** a magnificent and sumptously decorated Doric octostyle peripteral temple, on the Danube, near Ratisbon; built between 1830–1842, as a national pantheon, consecrated to celebrated Germans of all walks of life. The idea of the erection is derived from the Walhalla, or Valhalla, the ancient paradise of Odin and the Scandinavian deities. See VALHALLA.

**Walke, Henry,** an American naval officer; born near Portsmouth, Va., Dec. 24, 1808; was appointed to the navy in February, 1827; and took part in the Mexican War as executive officer on the brig "Vesuvius," where he engaged in the capture of Vera Cruz and in the operations against Tabasco, Tuspan, and Alvardo. Immediately prior to the outbreak of the Civil War in 1861, he took measures which prevented the occupation of Fort Pickens by the Confederates. He served with distinction throughout the war; commanded the squadron that coöperated with Grant at the battle of Belmont and covered the retreat of the National army; participated in the battle of Fort Henry, for which he received the thanks of the Secretary of War, of Congress, and of the State of Ohio; opened the battle of Fort Donelson and was the last to retire from the front line of battle; took part in the bombardment of Island No. 10, when he voluntarily ran the gauntlet of the Confederate batteries and captured the batteries below the island; and commanded the second division of the fleet at the battle of Grand Gulf, silencing the main fort on Point of Rocks. Subsequently he dispersed the Confederates under General Taylor at Simmsport, La.; blockaded the mouth of Red river; commanded the "Sacramento" in search of the "Alabama"; blockaded the "Rappahannock" at Calais, France, till the close of the war; and intercepted her when she escaped to British waters under the British flag. On April 26, 1881, he was retired at his own request to hasten the promotion of junior officers. He died in Brooklyn, N. Y., March 8, 1896.

**Walker, Alexander Joseph,** an American editor; born in Fredericksburg, Va., Oct. 13, 1819. He successively edited the New Orleans "Delta," "Times," "Jeffersonian," "Herald," and "Picayune," and subsequently the Cincinnati "Enquirer." He published "Jackson and New Orleans" (1856); "Life of Andrew Jackson"; "History of the Battle of Shiloh"; "Butler at New Orleans"; and "Duelling in Louisiana." He died in Fort Scott, Ark., Jan. 24, 1893.

**Walker, Amasa,** an American political economist; born in Woodstock, Conn., May 4, 1799. He was for many years engaged in commercial pursuits; from 1842 to 1848 lectured on political economy at Oberlin College; in 1848 became a member of the Massachusetts Assembly, and in 1849 of the Senate; in 1851–1852 was Secretary of State, and in 1862–1863 was Republican member of Congress from Massachusetts. From 1858 to 1869 he was lecturer on political economy at Amherst College. He was one of the editors of the "Transactions" of the Agricultural Society of Massachusetts (7 vols. 1848–1854). He wrote: "Nature and Uses of Money and Mixed Currency" (1857); and "The Science of Wealth" (1866). He died in North Brookfield, Mass., Oct. 29, 1875.

**Walker, Asa,** an American naval officer; born in Portsmouth, N. H., Nov. 13, 1845; was graduated at the United States Naval Academy in 1866; was promoted master in 1869, lieutenant in 1870, lieutenant-commander in 1884, and commander in 1894; was assigned to the command of the "Concord" in 1897, and with her engaged in the battle of Manila Bay, May 1, 1898. Promoted captain in 1899, he was on duty

at the Naval War College, Newport, R. I., till 1900, when he became a member of the Naval Examining Board at Washington, D. C. Rear-Admiral 1906; retired 1907.

**Walker, Francis Amasa,** an American educator; born in Boston, Mass., July 2, 1840; was graduated at Amherst College in 1860; served throughout the Civil War, distinguishing himself on various fields. On Aug. 25, 1864, he was captured at Ream's Station, and for a short time was detained in Libby prison; was promoted colonel Dec. 23, 1862, and received the brevet of Brigadier-General of volunteers March 13, 1865; was superintendent of the 9th census in 1870–1879; became Professor of Political Economy in the Sheffield Scientific School of Yale University in 1873; and in the latter year accepted the preseidency of the Massachusetts Institute of Technology, where he served till his death, Jan. 5, 1897. He was the author of "The Indian Question" (1876); "Money" (1878); "Money, Trade, and Industry" (1879); "Political Economy" (1883); "History of the Second Army Corps" (1886); etc.

**Walker, Frederick,** an English painter; born in London, May 24, 1840; studied at the Royal Academy (1858), and designed for illustrations for the "Cornhill Magazine" and "Once a Week" (1860–1864). Some of these drawings he reproduced in water-color, in which medium he produced a number of exquisite pictures. In 1863 he exhibited his first oil painting, "The Lost Path," at the Royal Academy, and was made an associate R. A. in 1871. His best works in oil are "The Bathers," and "By the Plough." He died in St. Fillans, Scotland, June 4, 1875.

**Walker, George,** a British clergyman; born of English parents, in County Tyrone, Ireland, about 1650. He studied theology at Glasgow University, and after taking orders obtained the living of the parish of Donoughmore, Ireland. The arrival of James II. in Ulster (1689), caused Walker to seek refuge in Londonderry; and in the memorable siege of that city he took the most prominent part. After the siege he went to London, was presented with the bishopric of Derry and $2,500 and Parliament voted him its thanks. He wrote a "True Account of the Siege of Londonderry" (1689); and a "Vindication." He accompanied William III. in his Irish campaign, and fell in the battle of the Boyne, July 12, 1690.

**Walker, James,** an American educator; born in Burlington, Mass., Aug. 16, 1794. He became Professor of Moral and Intellectual Philosophy in Harvard College in 1839; was president in 1853–1860; and editor of the "Christian Examiner" in 1831–1839. Besides sermons and addresses, editing the works of Dugald Stewart, Dr. Thomas Reid, etc., he published a "Memoir of Josiah Quincy" (1867), and delivered lectures on "Natural Religion" and "The Philosophy of Religion." He was famous as a pulpit orator. There is a mural monument dedicated to him in the Harvard Church in Charleston, Mass. He died in Cambridge, Mass., Dec. 23, 1874.

**Walker, James,** an American artist; born in England, June 3, 1819; settled in New York city early in life and lived there till 1884, when he went to San Francisco to execute a French battle piece for a private gallery. He became widely known as a painter of historico-military pictures. His principal works include: "The Battle of Lookout Mountain"; "The Battle of Chapultepec"; and "The Repulse of Longstreet" at Gettysburg; etc. He died in Watsonville, Cal., in September, 1889.

**Walker, James Barr,** an American clergyman; born in Philadelphia, July 29, 1805. Besides editorial work, he wrote: "The Philosophy of the Plan of Salvation" (1855); "God Revealed in Nature and in Christ" (1855); "Philosophy of Skepticism and Ultraism" (1857); "The Philosophy of the Divine Operation in the Redemption of Man" (1862); and "The Living Questions of the Age" (1869). He died in Wheaton, Ill., March 6, 1887.

**Walker, John,** an English author; born in Devonshire; was educated at Exeter College, Oxford, graduating M. A. in 1699. He became rector of St. Mary-the-More, Exeter. His famous work is entitled "An Account of the Sufferings of the Clergy who were Sequestered in the Grand Rebellion" (folio, 1714). The work itself was called forth by Calamy's "Abridgement of the Life of Mr. Baxter," nearly half of which is the famous "Particular Account of the Ministers who were Ejected by the Act of Uniformity," and Calamy himself replied to it in "The Church and Dissenters compared as to Persecution" (1719). Withers, a dissenting minister of Exeter, also made a reply, and still more Neal in his "History of the Puritans." Walker estimated at over 7,000 the number of clergy "imprisoned, banished, and sent a-starving." He died in Exeter, about 1730.

**Walker, John,** an English lexicographer; born in Colney Hatch, near London, March 18, 1732. His books are a "Rhyming Dictionary" (1775); "Elements of Elocution" (1781); "Rhetorical Grammar" (1785); and a "Critical Pronouncing Dictionary and Expositor of the English Language" (1791), which was long the standard work of its class, running through 40 editions. He died in London, Aug. 1, 1807.

**Walker, John Grimes,** an American naval officer; born in Hillsboro, N. H., March

Walker

20, 1835; was graduated at the United States Naval Academy in 1856; promoted lieutenant in 1858; and at the outbreak of the Civil War in 1861 was assigned to duty in the blockading service. During the war he participated in the capture of New Orleans and the operations against Vicksburg in the summer of 1862; commanded the "Baron de Kalb" of the Mississippi squadron in several engagements; had charge of a naval battery at the siege of Vicksburg; was executive officer on board a gunboat at the capture of Wilmington, N. C., and took an active part in several other engagements. He was secretary of the Lighthouse Board in 1873–1878; chief of the Bureau of Navigation in 1881–1889; promoted commodore in 1889; commanded the "Squadron of Evolution" in 1889-1894; and in the latter year, on his promotion to rear-admiral, was assigned to the Pacific station; being particularly charged with the maintenance of peace and good order in the Hawaiian Islands. He was chairman of the Lighthouse Board in 1895-1896; president of the Nicaragua Canal Commission in 1897-1899, and of the Isthmian Canal Commission in 1899-1904; and chairman of the Panama Canal Commission in 1904-1905. He died Sept. 15, 1907.

**Walker, Katharine Kent (Child),** an American author; born in Pittsfield, Vt., about 1840. She wrote a famous article for the "Atlantic Monthly" on "The Total Depravity of Inanimate Things" (September, 1864); and has published a version of Bunyan entitled "Pilgrim's Progress for Children" (1869); "From the Crib to the Cross" (1869); a "Life of Christ" (1869); and translations from the German.

**Walker, Robert John,** an American financier; born in Northumberland, Pa., July 23, 1801; was graduated at the University of Pennsylvania in 1819; practised law in Pittsburg, Pa., in 1822–1826, and in the latter year removed to Mississippi. There he entered politics and was elected to the United States Senate in 1836 and 1840. While in the Senate he opposed the distribution of the surplus revenue, advocating instead, its application to public defenses; introduced the celebrated "Homestead" bill; sustained the treaty for the suppression of the slave trade; and drafted and supported the resolution recognizing the independence of Texas. On the accession of James K. Polk to the presidency in 1845, he was appointed Secretary of the Treasury, and continued in that office till March, 1849, during which period he prepared and carried through the tariff bill of 1846, various loan bills, the warehousing system, the Mexican tariff, and a bill to organize the Department of the Interior. Subsequently he was governor of Kansas, in which office he defeated the attempt to force corrupt measures on the territory; was actively occupied in the support of the National government prior to the Civil War, advocating the immediate reënforcement of Southern fortifications and the maintenance of the Union by force; and in 1863 was sent as financial agent of the United States to Europe, where he negotiated the sale of $250,000,000 in 5-20 bonds. On his return in 1864 he applied himself to the practice of law and to literary work, writing extensively for the "Continental Review." He died in Washington, D. C., March 11, 1869.

**Walker, Sears Cook,** an American astronomer; born in Wilmington, Mass., March 28, 1805; was graduated at Harvard College in 1825; taught school for several years near Boston and in Philadelphia, and actively engaged in scientific work. He prepared a set of parallactic tables for the latitude of Philadelphia, which greatly facilitated the process of computing the phases of an occultation in 1834; planned the organization of an observatory in connection with the Philadelphia high school in 1837; published a valuable paper on the periodical meteors of August and November, 1841; and in 1845 received an appointment in the Washington Observatory, where on Feb. 2, 1847, four months after the discovery of the planet Neptune, he indentified that planet with a star observed by Lalande in May, 1795. From 1847 till his death he had charge of the longitude computations of the United States Coast Survey, and in this connection he develeoped with Professor Bache the method of determining differences of longitude by telegraph, which was first put into successful operation in 1849. He died in Cincinnati, O., Jan. 30, 1853.

**Walker, William,** an American adventurer; born in Nashville, Tenn., May 8, 1824; studied law in Nashville, and medicine in Germany. In July, 1853, he organized an expedition against Sonora, Mexico, but was compelled to surrender to the United States commander at San Diego, Cal. In 1855, at the instigation of American speculators, he went to Nicaragua with 62 followers, and in conjunction with a small native force defeated a Nicaraguan army of 540 men at Rivas. He then took the city of Grenada, and through a treaty with Gen. Ponciano Corral, his antagonist, he was made Secretary of War and Commander-in-Chief. He established a government, but was driven from power, and surrendered to the United States authorities in May, 1857. In June, 1860, he invested Honduras; was captured by the commander of the British man-of-war "Icarus"; and was delivered to the Honduras authorities. After being tried by court-martial he was shot in Trujillo, Honduras, Sept. 12, 1860. He

was the author of "The War in Nicaragua" (1860).

**Walker, William Sidney,** a British poet; born in Pembroke, Wales, Dec. 4, 1795. He was a fellow of Trinity College, Cambridge (1822–1829), becoming blind during that time. Besides translating a "Collection of Latin Poets" (new ed. 1854), he wrote "Gustavus Vasa" (1813), an epic poem; "Shakespeare's Versification" (3d ed. 1859); "Critical Examination of the Text of Shakespeare" (3 vols. 1859). "Poetical Remains," with a memoir, appeared in 1852. He died in London, Oct. 15, 1846.

**Walker, Williston,** an American clergyman; born in Portland, Me., July 1, 1860; was graduated at Amherst College in 1883 and at Harvard Theological Seminary in 1886; was Professor of Church History at the latter in 1889-1901, then of Ecclesiastical History at Yale; works: "On the Increase of Royal Power under Philip Augustus"; "History of the Congregational Church in the United States"; "The Creeds and Platforms of Congregationalism"; "Ten New England Leaders."

**Walker, Fort,** one of the defenses of Port Royal, S. C. It is no longer garrisoned.

**Walker's Battery,** in electricity, a battery resembling Smee's battery, except that the electro-negative plate is gas graphite or platinized graphite. It is excited by dilute sulphuric acid.

**Walker's Earth,** in geology, the name given in Herefordshire, England, to an unctuous fuller's earth, occurring in beds separating the Aymestry or Ludlow limestone (Upper Silurian). It tends to decay and produce landslips.

**Walking Delegate,** a peripatetic official of a trade union, whose duty it is to visit the various places at which members of his craft are employed, and personally ascertain that no laws of that particular trade guild are infracted by the workmen; also, in cases where an unexpected strike has been ordered by the executive board, it devolves on him to notify men connected with the union to cease work.

**Walking Leaf.** See Leaf Insect.

**Walking Stick,** in entomology, a popular name for any species of the family *Phasmidæ*, from the fact that they are destitute of wings, and resemble dry twigs so closely that, except for their motion, it is difficult to believe they are really alive. They are natives of sub-tropical and the warmer temperate regions, and walk gently among the branches of trees, reposing in the sun, with their long, antennæ-like legs stretched out in front; called also animated sticks, walking straws, etc.

**Walking-sticks, or Canes,** slender instruments in use from the remotest antiquity, not merely for helping to support the weight of the person, but for the appearance of dignity and elegance they lend. Developments from the walking stick are the pastoral staff, the scepter, the constable's baton or staff, and the rod or wand of office generally. The pilgrim's staff in the Middle Ages was a stout stick four feet long and made hollow at the top, presumably for containing relics; but the hollow was sometimes convenient for conveying secretly valuable plants, seeds, or eggs (such as saffron and silkworm eggs), of which Chinese, Turks, and Greeks forbade the export. At a later date the tall sticks of doctors had a smaller receptacle to contain snuff or other supposed disinfectants. Magnificent and costly sticks were part of the equipment of fops in the 18th century. For the making of walking sticks almost every kind of wood is used. Thus in England oak, ash, crab, hazel, sloe or blackthorn, broom, and juniper are favorite woods. Small stems or canes of some palms — as Malacca canes and Penang lawyers — are imported into London in large numbers; the midribs of some palm leaves are serviceable, as are shoots of bamboo, of orange, myrtle, cinnamon, and sweet cherry. The heads — flat, round, crooked — may be of the same piece of wood or may be fixed on, carved or plain, made of deer's or other horn, or of ivory, silver, etc.

**Walking Wheel,** a pedometer; also a cylinder which is made to revolve about an axle by the weight of men or animals climbing by steps either its internal or external periphery, and employed for the purpose of raising water, grinding corn, and various other operations for which a moving power is required.

**Walkyries.** See Valkyrjur.

**Wall, The Devil's.** See Devil's Wall.

**Wallaby,** a name common to several rather small-sized kangaroos of the genus *Halmaturus*.

**Wallace, Alfred Russell,** an English naturalist; born in Usk, Monmouthshire, England, Jan. 8, 1823; was educated at Hertford grammar school. He spent many years in traveling, especially in South America and the Asiatic Islands. His observation of animal life early led him on the track of natural selection, and before Darwin gave his famous work to the world he had published "Speculations on the Origin of Species. Wallace differed from Darwin on the subject of the intellectual, moral, and spiritual nature of man, and claimed to be at once a Darwinian and an anti-materialist. He was president of the Land Nationalization Society and a member of various scientific bodies. The Royal

Wallace

Society of London awarded him the royal medal in 1868, and the Geographical Society of Paris the gold medal in 1870. He wrote: "Travels on the Amazon and Rio Negro"; "The Malay Archipelago"; Tropical Nature"; "Geographical Distribution of Animals"; "Natural Selection" (1870); "Miracles and Modern Spiritualism" (1874); "Australasia" (1879); "Island Life" (1880); "Land

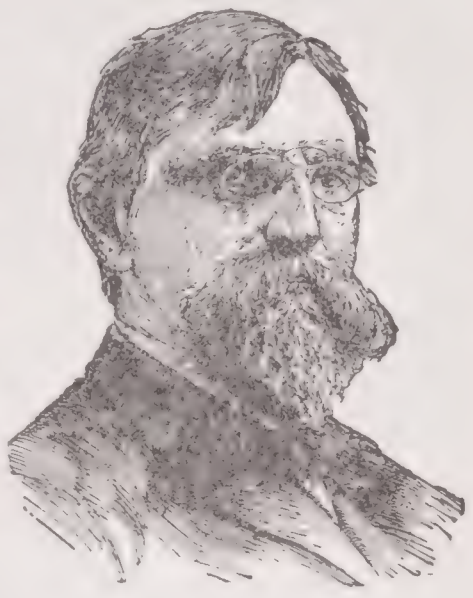
ALFRED RUSSEL WALLACE.

Nationalization" (1882); "Bad Times" (1885); "Darwinism" (1889); "The "Wonderful Century" (1898); and many scientific and popular papers.

**Wallace, David Duncan,** an American historian; born in Columbia, S. C., May 23, 1874; was graduated at Wofford College in 1894, and then pursued special studies in English, history, and economics; was made Professor of History and Economics at Wofford College, 1899. His publications include "Constitutional History of South Carolina, 1725 to 1755" (1899); "Arrival of the Tea, and the Origin of the Extra-Legal Organs of Revolution in South Carolina"; etc.

**Wallace, Horace Binney,** an American author; born in Philadelphia, Feb. 26, 1817. In addition to contributing to literary periodicals, he published anonymously a novel, "Stanley; or, The Recollections of a Man of the World" (1838); and edited, in conjunction with Judge Hare, "American Leading Cases in Law" (2 vols. 1847; 3d ed. 1852); Smith's "Leading Cases" (4th American ed. 2 vols., 1852); and White and Tudor "Leading Cases in Equity" (2d American ed. 3 vols. 1852), all copiously annotated. He helped Rufus W. Griswold in his "Napoleon and the Marshals of the Empire" (2 vols. 1847). "Art and Scenery in Europe, with Other Papers" (1855), and "Literary Criticisms, and Other Papers" (1856), are posthumous publications. He died in Paris, Dec. 16, 1852.

**Wallace, Lewis** (better known as Lew), an American military officer and author; born in Brookville, Ind., April 10, 1827; was lieutenant in the Mexican War in 1846–1847; took a distinguished part in the Civil War in which he served in the campaigns in West Virginia and Kentucky; commanded a division at the capture of Fort Donelson; led the attack in the second day's fight in the battle of Shiloh; took part in the subsequent advance on Corinth; saved Cincinnati, O., from capture by Gen. E. Kirby Smith; and was president of the court appointed to investigate the conduct of General Buell. In 1864 he commanded the Middle Department and the 8th Army Corps, and in the battle of Monocacy (July 9, 1864), prevented the capture of Washington and Baltimore by General Early. He was a member of the commission which tried the assassins of President Lincoln, and in the same year presided over the court which tried Captain Wirz, the commandant of the Andersonville prison. In 1866 he was sent to Mexico on a secret diplomatic mission to President Juarez; was appointed governor of New Mexico in 1880; and was United States Minister to Turkey in 1881–1885. When not engaged in public service he practised law and devoted himself to literature. His publications include: "The Fair God"; "Ben Hur, a Tale of the Christ"; "The Prince of India"; etc. He died Feb. 15, 1905.



LEWIS WALLACE.

**Wallace, Sir Richard,** an English philanthropist; born in London, England, July 26, 1818; removed to Paris; and became heir to the large fortune of the Marquis of Hertford, including a very valuable collection of paintings and other objects of art, to which he made large additions and which his widow bequeathed in 1897 to the nation. It is valued at $25,000,000 and is permanently on exhibition in Hertford House (the original of Gaunt House in "Vanity Fair"). Sir Richard was well known for his extensive benefactions, especially during the period of the Paris Commune, and these services were

recognized in 1871 by his elevation to a baronetcy and his appointment as a commander of the Legion of Honor. In 1873 he was elected to Parliament. He died in Paris, July 20, 1890.

**Wallace, Susan Arnold Elston,** an American author; wife of Gen. Lewis Wallace; born in Crawfordsville, Ind., Dec. 25, 1830; was married to General Wallace in 1852. Besides contributing to periodicals and reviews, she published: "The Storied Sea"; "Ginevra"; "The Land of the Pueblos"; "The Repose in Egypt"; etc. She died Oct. 1, 1907.

**Wallace, Sir William,** a Scotch patriot; born in Ayrshire, Scotland, about 1274. Having slain the son, and several of the retainers of the English sheriff of Dundee, for an insult offered to him, Wallace fled to the woods, and was outlawed. Gathering together a number of followers, he drove the English out of Aberdeen, Forfar, Brechin, and elsewhere, and in 1297 defeated the English army at the battle of Stirlingbridge — thus liberating his country for a time. He was chosen one of the commanders-in-chief of the Scotch army, and afterward guardian of the kingdom, during the captivity of Baliol. He penetrated into England, and ravaged Durham with fire and sword. Edward I., then in Flanders, immediately hastened home, and marched against Wallace, who was defeated. He carried on a guerilla warfare against the English during several years, was betrayed, and executed in London, Aug. 24, 1305.

**Wallace, William Ross,** an American lawyer and poet; born in Lexington, Ky., in 1819. He wrote: "Perdita"; "Alban"; "Meditations in America, and Other Poems." "The Liberty Bell" is his best-known poem. He died in New York city, May 5, 1881.

**Wallace, William Vincent,** a British musical composer; born of Scotch parents, in Waterford, Ireland, June 1, 1814. From his father, a bandmaster, he learned to play on military instruments, and also studied the violin, pianoforte, and guitar. He spent some years in Australia, and made an extensive concert tour in the Australian colonies, India, and the United States. In 1845 he went to London, and devoted himself to composition. His first opera, "Maritana," was produced at Drury Lane, 1846, and secured him at once a reputation. "Lurline" and the "Amber Witch" are his other chief operatic compositions. He wrote numerous airs for the pianoforte. He died in Haute Garonne, France, Oct. 12, 1865.

**Wallachia,** one of the two principalities of Southern Europe that were united in 1861 to form the kingdom of Rumania. It is bounded in the N. by Moldavia and Transylvania, on the N. W. by Hungary, on the W. and S. by the Danube river, separating it from Servia and Bulgaria, and on the E. by the Danube, separating it from Dobrudja; area about 30,000 square miles; capital, Bucharest. The surface is highest in the N. and W., where the elevation of the mountains averages from 3,000 to 4,000 feet, and slopes toward the Danube where there are extensive plains, often swampy. There are large tracts of forest in the higher portions, and pasture land abounds farther S. Copper, gold, iron, silver, lead, sulphur, marble, and asphaltum are found, with petroleum in abundance. There are also valuable mines of rock salt. The climate is subject to extremes, being especially severe in the mountains. The soil is fertile and wheat, maize, barley, hops, tobacco, and flax are extensively raised. The vine and other fruits are much cultivated. Cattle, sheep, and goats form a large part of the wealth of the country. Excellent wool is produced.

For purposes of local government it is divided in 17 districts, each of which has a prefect, a receiver of taxes, and a civil tribunal. The principality of Wallachia was formed in the 13th century. About the close of the 14th century it became subject to Turkey under Wallachian rulers and after 1716 under Fanariot hospodars, with occasional Russian interventions. In 1829 a greater degree of independence was secured, and in 1859 Alexander Cuza, Prince of Moldavia, became also Prince of Wallachia. The union of the two principalities was acknowledged by the Porte in 1860, and proclaimed in 1861. See RUMANIA.

**Wallachian Sheep,** a variety of *Ovis aries,* remarkable for the enormous development of its horns, which resemble those of the koodoo. The fleece is composed of a soft woolly undercoat, covered with and protected by long drooping hair. Natives of Western Asia and the adjacent portions of Europe; common in Wallachia, Hungary, and Crete. Called also the Cretan sheep.

**Wallack, James William,** an American actor; born in London, England, Aug. 24, 1795; began his professional career as Laërtes to Elliston's Hamlet in 1813; and in 1816 appeared as Iago to Edmund Kean's Othello. He came to the United States in 1818, and on Sept. 7 made his first appearance in New York city in the Park theater as Macbeth. He became stage manager of the Drury Lane theater in 1820; opened the National theater in New York city and managed it till it was destroyed by fire in 1839; opened Wallack's Lyceum in 1852 and in 1861 built Wallack's theater in New York city. He died in New York city, Dec. 25, 1864.

**Wallack, Lester John,** an American actor and manager, son of James William Wallack; born in New York, Jan. 1, 1820.

He conducted Wallack's Theater, New York city, for 24 years; was identified with the American stage for more than 40 years; and on his retirement in May, 1888, was the recipient of an unequalled dramatic testimonial. He wrote the plays "The Veteran" and "Rosedale." His autobiography, "Memoirs of Fifty Years," was published the year after his death. He died in Stamford, Conn., Sept. 6, 1888.

**Wallaroo,** the native Australian name given to two species of kangaroos, the *Macropus antipolinus*, the red wallaroo, and *M. robustus*, the black wallaroo, found in New South Wales.

**Wallath, Wilhelm** (väl'lät), a German story-writer; born in Darmstadt, Germany, Oct. 6, 1856. He wrote: "The King's Treasure House" (3 vols. 1883); "Paris the Mime" (1886); "The Gladiator" (1888); "Tiberius" (2 vols. 1889); "The Demon of Envy" (1889); "There Came a Hoar Frost" (1893); "Love's Fools" (1894); three stories of modern life; and some dramas, as "Countess Pusterla," "John of Suabia," "Marino Falieri," "The Sacrifice."

**Walla-Walla,** city, county-seat of Walla-Walla co., Wash., about 200 miles S. W. from Spokane. It is on the Walla-Walla river, 28 miles E. of where that empties into the Columbia: on branch lines of the Northern Pac. and the Union Pac. railroads. Its origin was a United States fort, set there in 1857, and the trading post was called Steptoe City, until 1859, when it was incorporated and received the name Walla-Walla in memory of an Indian tribe formerly occupying the region. In 1862 and again in 1884 it received charters. A mayor, elected yearly, and a city council of seven, are the nucleus of the government. The Walla-Walla river valley is aboundingly fertile in various grains—wheat, barley, oats—and a variety of vegetables and fruits. Walla-Walla is the distributing center for this region and for the adjoining portions of Oregon on the S. and Idaho on the E.

In the city the manufactures are perhaps chiefly in agricultural implements and machinery, although there are also flouring and lumber mills, breweries, and factories for leather, cigars, sashes, blinds and doors, gas and electric power works, and other industries. The waterworks belong to the city. The educational establishments of Walla-Walla are worthy of note. These are Whitman College and Academy; two Roman Catholic Seminaries, for girls and for boys; the St. Paul's Seminary for girls (Episcopal); De La Salle Institute; Walla-Walla College (2 miles W. of the city); a fine system of public schools, a public library, and other institutions. There are some fine public buildings. Fort Walla-Walla, a government military post, is immediately W. of the city. Pop. est. (1903), 11,661, a gain of 1,602 since 1900, and of 6,942 since 1890; (1910) 19,304.

**Wall-box,** in machinery, a device for supporting a plummer block in which a shaft rests in passing through a wall. It consists of a rectangular cast-iron frame, having arrangements for receiving and holding the box in fixed position.

**Wall Butterfly,** the *Lasiommata megœra* (Stainton), *Pyrarga megœra* (Newman), a European butterfly. Wings fulvous, with dark-brown markings; the fore ones with a black spot having a white center, and the hind ones with three similar spots and the rudiments of a fourth. Caterpillar green, with two yellowish lines on each side: the head and the tail reddish. It feeds on timothy grass.

**Wall Creeper,** the *Tichodroma muraria*, a native of Southern and Central Europe. It frequents walls and perpendicular rocks in preference to trees, the favorite resort of the genus *Certhia*. It is a very pretty bird, about six inches long; plumage light gray, with bright crimson on the shoulders, the larger wing coverts, and the inner webs of the secondaries; the rest of the wings black; tail black, tipped with white. Called also spider catcher, from its habit of feeding on spiders and insects.

**Wallenstein, Albrecht Wenzel Eusebius, Count von** (val'len-stine), the great general of the Imperialists, in the Thirty Years' War; born in 1583, of an ancient and wealthy family of Bohemia. In his youth he repaired to Italy, where he studied philosophy, astronomy, and the sciences then in vogue, and would have become an adept in the abstruse doctrines then so generally believed in, had not the condition of his country called him from the study of the occult sciences to the practice of war. As a soldier and leader he gained honor and distinction on his first field by defeating the Turks, who had penetrated into Hungary. From this time he devoted himself to the service of his country, and in a few years rose to be regarded as the most popular and consummate general in Europe; his vast wealth, immense estates, and extraordinary popularity giving him a power and influence hardly less than sovereign. He became in a few years the mainstay and support of the Imperial cause, and, both alone and in conjunction with Tilly, obtained several victories, and more than once raised the empire from the verge of ruin by his counsel and skill as a commander. For these services he received the dukedom of Mecklenburg, and immense tracts of land both in Bohemia and Hungary. His power and his influence, however, procured for him many enemies, to whom his sovereign, forgetful of the services he had rendered, lent so willing an ear that

Wallenstein, indignant at the coldness of the emperor, threw up his commission and retired to the privacy of his paternal estates.

Hardly had Wallenstein quitted the court of his ungrateful master when the "Lion of the North," as he was called—Gustavus Adolphus of Sweden—invaded the empire with his Protestant army, and carried such defeat and ruin into the heart of the Imperial dominions, that the Emperor Ferdinand, seeing his generals slain, his armies routed, and the haughty foe advancing on his capital, was compelled to implore Wallenstein—the man he had so deeply injured—to return, and not only save the empire from ruin, but his sovereign from humiliation. Having obtained his own terms from the weak and ungrateful Ferdinand, Wallenstein raised his banner, and so much was he beloved by the soldiery that in less than seven days he had armed and equipped 50,000 men at his own cost, and, advancing against the successful enemy, drove Gustavus out of Bavaria, and following him into Saxony, forced him at Lützen to hazard a pitched battle, in which, though the Imperialists were defeated, the death of Gustavus, who fell in the moment of victory, was considered an ample equivalent. The death of the Swedish king made the rest of the war easy, and by Wallenstein's vigilance the empire was again saved. Ferdinand, once more firmly seated on his throne, again became envious of the man to whom he owed both life and crown, and, taking offense at the devotion of Wallenstein's officers, accused their chief of treason, and issued an order to take him dead or alive. On this Wallenstein fled with a party of friends to the Castle of Egar, where its commander treacherously murdered him and all his devoted friends, in 1634.

**Waller, Edmund,** an English poet; born in Coleshill, Hertfordshire, England, March 3, 1605. He was educated at Eton and King's College, Cambridge. His mother was a sister of John Hampden, and a royalist, but all the rest of his relatives were against the court. His first collection of poems appeared in 1645. He was noted for his wit and was a great favorite at court, in Parliament, and in society, and sang the praises of the Lord Protector as well as those of the Stuarts. He was a member of the "Long Parliament" and was sent as commissioner to the king, after the battle of Edgehill. Shortly after, he plotted in favor of the king, and when detected, turned informer, but by judicious bribery got off with banishment and a fine of $50,000. After nearly 10 years of exile in Paris, Cromwell allowed Waller to return in 1653, and he took his usual place in society and Parliament, and was afterward welcome at the courts of Charles II. and James II. He died in Beaconsfield, England, Oct. 21, 1687.

EDMUND WALLER.

**Waller, John Francis,** an Irish author; born in Limerick, Ireland, in 1810. He graduated at Trinity College. He wrote for the "Dublin University Magazine," "The Slingsby Papers," over the signature of "Jonathan Freke Slingsby." These were collected in a volume in 1852; his "Poems" were published in 1854. He edited the works of Goldsmith, Moore, etc., together with the "Imperial Dictionary of Universal Biography." He died Jan. 9, 1894.

**Wallet,** a bag for carrying the necessaries for a journey or march; a knapsack; a peddler's pack; a mendicant's receptacle for alms; also, a paunch or bag-like purse; a pocketbook for keeping money about the person. Also, anything bulging, protuberant, swaging; as, wallets of flesh.

**Wallflower,** the common name of the species of plants belonging to the genus *Cheiranthus*, natural order *Cruciferæ*. They are biennial or perennial herbs or undershrubs. Many of them exhale a delicious odor, and are great favorites in gardens. The best known is the *C. Cheiri*, or common wallflower, which, in its wild state, grows on old walls and stony places. In the cultivated plants the flowers are of more varied and brilliant colors, and attain a much larger size than in the wild plant, the flowers of which are always yellow.

**Wallich, Nathanael** (val'lik), a Danish botanist; born in Copenhagen, Denmark, Jan. 28, 1787. From 1815-1847 he was director of the botanic garden at Calcutta. He wrote: "An Essay on the Flora of Nepâl" (1824-1826); "Rare Asiatic Plants" (3 vols. 1830-1832). He died in London, April 28, 1854.

**Wallin, Johan Olof** (väl-lēn'), a Swedish poet; born in Dalarna, Sweden, Oct. 15, 1779. He was made Archbishop of Upsala in 1837. His hymns and religious songs are in high repute in Sweden, and he was called "Sweden's Harp of David." Among his poems are "The Educator" and verses on George Washington. His finest production is "The Angel of Death." He was a notable pulpit orator. He died in Upsala, Sweden, June 30, 1839.

**Walling Wax,** a composition of wax and tallow, used by etchers and engravers to make a bank or wall round the edge of a plate, and so form a trough into which the

acid is poured over the lines incised through the etching ground, and which bites in the lines as it lies on the surface. The wax is rendered soft by steeping in hot water, and when of the consistency of putty, is stuck round the plate, and allowed to cool and harden, a spout being made on one side to carry off the acid.

**Wallis, John,** an English mathematician; born in Ashford, England, Nov. 23, 1616. Educated for the Church at Emanuel College, Cambridge, he took orders in 1640, and in 1663 obtained a living in London. He was one of the secretaries to the Assembly of Divines at Westminster; became Savilian Professor of Geometry at Oxford in 1649. Charles II., for services rendered to the royal cause, made him one of the royal chaplains, and in 1661 he was one of the revisers of the "Book of Common Prayer." He was one of the earliest and most useful members of the Royal Society, founded in 1663. He was the author of many mathematical, theological, and controversial works and papers, the most important of which are his "Arithmetic of the Infinities," and his "Mechanics." He died in Oxford, Oct. 28, 1703.

**Wallis, Sir Provo William Parry,** a British naval officer; born in Halifax, Nova Scotia, April 12, 1791. He served in the British navy against the French, and in 1813 was 2d lieutenant on the "Shannon" which captured the United States frigate "Chesapeake" off Boston, on June 1, in the engagement in which Capt. James Lawrence was killed. The captain of the "Shannon" being severely wounded and the 1st lieutenant killed, Wallis took command and carried the "Chesapeake" to Halifax. For his part in the encounter he was promoted commander. He became rear-admiral in 1851, vice-admiral in 1857, admiral of the White in 1863, and admiral of the fleet in 1877. By special order of Queen Victoria, he was retained in the service after passing the age of retirement, 70 years. He died near Chichester, England, Feb. 13, 1892.

**Wallis Archipelago,** a group of islands in the Pacific Ocean N. E. of Fiji; area 40 square miles; placed under a French protectorate in 1887. There is a French resident and the islands are in regular communication with New Caledonia.

**Wallis, Severn Tackle,** an American lawyer; born in Baltimore, Md., Sept. 8, 1816; was graduated at St. Mary's College, Baltimore, in 1832; admitted to the bar in 1837; studied Spanish history and literature; and became identified with the Royal Academy of History of Madrid in 1843. He was a special United States agent to Spain in 1849, to inquire into the title of public lands in Eastern Florida as affected by certain royal grants before the ratification of the treaty of 1819. In 1861 he was a Democratic member of the Maryland Legislature. He served as chairman of the Committee on Federal Relations and took a leading part in the agitation against the Civil War. With other members of the Legislature and other citizens of Maryland he was made a prisoner in September, 1861, and liberated in November, 1862, but without explanation as to the cause of his arrest and detention. He resumed the practice of law, and in 1870 was made provost of the University of Maryland. He was the author of "Glimpses of Spain" (1849); "Spain: Her Institutions, Politics, and Public Men" (1853); and a "Discourse on the Life and Character of George Peabody" (1870); etc. He died in 1894.

**Wallon, Alexandre Henri** (vä-lôn*g'*), a French author; born in Valenciennes, France, Dec. 23, 1812. In 1840 he became Professor of Modern History and Geography in the Sorbonne. He was elected to the Legislative Assembly in 1849, and to the National Assembly in 1871, and was Minister of Public Instruction in 1875–1876. He was popularly known as "The Father of the Republic" on account of his amendment carried Jan. 30, 1875. His principal works concerned the life of Christ, and the writings of the apostles and evangelists. He wrote "The Life of Jesus and its New Historian" (1864); "Memoirs on the Years of Jesus Christ"; and other works designed to counteract the effects of Renan's writings. He is author also of "Political Geography of Modern Times" (1839); "Slavery in Ancient Times" (3 vols. 1847); "Joan of Arc" (2 vols. 1860); "Richard II." (2 vols. 1864); "The Reign of Terror" (2 vols. 1873); "St. Louis and his Times" (2 vols. 1875); "History of the Paris Revolutionary Tribunal, with the Journal of its Acts" (6 vols. 1880–1882); "The Representatives of the People, etc."; "France Conquered by the Commune of Paris"; etc. He died Nov. 14, 1904.

**Walloons,** or **Wallons,** lineal descendants of the old Gallic Belgæ, who occupy the Belgian provinces of Hainault, Liége, Namur, and part of South Brabant and West Luxembourg. They are superior in physique to their Flemish compatriots, and a large proportion of them have black hair and eyes. Their language, also called Walloon, is a French patois retaining numerous Gallic words, but it somewhat varies in the different provinces. The first permanent colony of New Amsterdam (New York) contained many Walloons, their present descendants being distinguished from those of Dutch lineage by their French names.

**Wall Paper,** for ordinary purposes consists of a tough, but not a thick paper, printed with a pattern in size colors. For expensive wall papers a rather stout paper is used, and for very cheap kinds a paper

of such poor quality that it can only be pasted on walls without tearing by great care. From the artist's room where the designs are evolved to the shipping department, where they are dispatched, finished in compact bundles, on their several journeys, the process of production is full of interest. The first stage is the designing in water-colors by the artist of the pattern which is to be reproduced. Then, as in chromolithography, the pattern is traced, and an estimate made of the number of colors that are to be used in the sketch. Say there are five, then five seasoned cedar rollers are prepared to receive the five portions of the sketch which contribute the five colors. The process by which these different portions of the sketch are placed upon the rollers is immensely curious. The designs stand from the surface of the rollers in high relief, and consist principally of thin hammered brass and felt. Where solid blocks of color are required that portion of the design is outlined with thin strips of brass which can be bent in any shape, these being pounded into the rollers with a tiny hammer and the spaces between the lines are filled in solid with strips of soft felt. When these surfaces are rolled with paint they print on the paper solid designs which perhaps represent the petals of a flower or the green of a leaf, etc. The first prints of color in the sketch are the body colors. Next in order come the shadings, the embellishments, dots of gilding, etc., each of these being defined on a separate roller. The work of outlining these designs is exceedingly difficult and laborious, the workman following the portions of the design which are traced on the rollers beforehand in order to be exact.

The work of outlining the designs on the rollers being completed, the first step is to print the background on the plain paper. The paper unwinds from large rolls weighing half a ton apiece, slowly passing under the moving machinery, up over rollers which carry it along to the brushes, which move rapidly back and forth across the paper as the latter passes along under them, and it emerges coated evenly with the required tint. This paint, by the way, is all mixed with water. Oil paint is not used at all; and the paint dries several shades lighter than it is in the liquid state. This fact has to be calculated on in producing effects.

To go back to the paper which has just received its background; it passes from the brushes up over a bar, traveling away from the machine and stretching out in a long sweep to where a double endless chain extending nearly 200 feet, the entire length of the building, traveling on a sort of miniature elevated railway, moves perpetually around and around the little railway. In these chains are notches which run parallel to each other, and they catch up in their progress, as they pass the nearest point to the tinting machine, wooden rods which are placed in a rack close to the chains. These rods catch the paper at regular lengths, bearing it up on to the little railway from which it hangs in long loops, and the procession of loops hanging from the rods resting upon the notches in the endless chains, marches slowly down the long building, drying enroute from the heat that emanates from a series of steam pipes which are laid along the floor under the railway. The heat grows more and more intense as the procession progresses, and by the time the journey is ended at the other end of the building all vestige of dampness has departed from the paper. The latter is rolled again as fast as it accumulates and deposited in compact bundles on the floor ready for the printing of the design.

The accomplishment of the latter process is done by means of a machine which prints several colors at once. This machine is circular in form, and has places for the adjustment of the cedar rollers which contain upon their rounded surfaces the different portions of the design to be printed, which represent the different portions of color in the design. Suppose for instance a single design of a spray of wild roses with green leaves on a delicate blue background is to be printed. The background is washed by means of the process described. To print the design say five rollers are used. The first bears the primary pink of the roses and any other touches of pink that may occur in the design. The next color is perhaps the shading of the pink, the darker portions of the petals, and next the green of the leaves, the next the yellow of the stamens of the flowers, and so on, the more intricate the pattern, the more colors it takes to print it, the more work to impress the pattern in its different portions upon the cedar rollers, and the more expensive it is to reproduce. Many of the patterns have finishing dots or lines of gold which lend brilliancy to the effect. These are all defined in the same way on a separate roller.

After the paper has received the whole of the design, winding around the big wheel and passing under each cedar roller, receiving tints, shading and embellishment, it sweeps out over the bar as described before. being caught up in long loops by the sliding rods which move on the endless chains, and the long procession of loops moves in order slowly down the building. At the other end of the little railway the wooden rods drop off from the chain into a big box and as they accumulate they are taken out and removed to the starting point, where they again set out on their slow journey across the building.

An automatic arrangement on the printing machine puts a little red mark on the

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paper at regular intervals of so many yards, the length of an ordinary roll of wall paper, and at the other end of the building is stationed a boy whose duty it is to roll the paper in the small rolls in which it is sold. As fast as the paper arrives from the drying journey it is wound around a small rod and at each red dot a sort of knife cuts off the paper, the roll is adjusted again and the work of winding proceeds.

**Wall Street.** The Wall street community is composed of the Stock, Produce, Cotton, Coffee and Consolidated Exchanges; the United States Sub-Treasury, Assay Office, and custom house; the New York clearing house, a multitude of National and State banks, trust companies, private banking firms, import and export houses, dealers in commercial paper and promoters, representatives of railroad and industrial corporations and of vast private estates, the "Curb" market, and hundreds of corporation lawyers and others who have close relations with the securities markets. It is there that railroads and industrial corporations are organized, financed and reorganized if necessary; that stock and bond securities of all kinds find their level of value; that money can always be borrowed on good collaterals; that money is transferred from one side of the world to the other through the medium of foreign exchange bills; that gold exports or imports are arranged; that money seeks investment in government bonds and all other American and some foreign securities. And it is in Wall street that fortunes are won and lost in stock speculation. Considered as a whole, Wall street is a true barometer of the country's financial condition, reflecting unerringly depression or prosperity. It is always forging a bit ahead of the times "discounting" known or expected factors, and sometimes upset by unexpected occurrences. True to American temperament, the stock market, considered alone, at times reflects an extravagant wave of optimism or an unjustifiable condition of pessimism, but as the money market is always a most reasonable place, normal conditions usually prevail.

The most interesting of all Wall street's interests is the stock market. The Stock Exchange is an unincorporated, voluntary association, resembling in organization a club, and having a membership of 1,100. Memberships or seats fluctuate in value. A man to become a member must buy a seat and then pass an examination before the committee of admissions. If he fails of acceptance he must sell the membership. If he is accepted, he, or his friends who lent the money used in buying the seat, must sign a paper releasing the membership from all claims. Should he become insolvent the membership is sold and the proceeds are divided among his Stock Exchange creditors. About 500 Stock Exchange firms, exclusive of individual brokers operating alone, transact the business of that institution.

The members of the exchange may be subdivided into four groups: (1) commission houses which buy and sell stocks and bonds for the public; (2) "specialists," "floor" or "$2" brokers who execute orders for commission houses; (3) individual speculators who trade for their own account and risk and (4) brokers who lend money for banks. Commission houses may be divided into two groups: (1) those that conduct a home and many branch offices connected by private wires and (2) those that transact a local and mail business. Transactions in stocks or bonds are based on quick delivery. If you buy for "cash," delivery is made on the day of sale. While odd lots of stock are dealt in, 100 shares is generally recognized as the unit. The par or nominal value of one share of stock is usualy $100, but there are "half" shares, so-called, where the par value is $50. Prices are based on a percentage of par or $100. In the quotations of stocks fractional parts of 1 per cent. (which is also called one "point"), play a conspicuous part. The smallest fraction used is one-eighth or $12.50 on each 100 shares. Fluctuations cannot be smaller than one-eighth.

When bought or sold outright the share certificates are delivered to the buyer or by the seller after an exchange of checks representing market values plus commissions and other charges. Trading on a margin can be compared to a real estate transaction. Thus, if you buy a $10,000 house, mortgaging it for $8,000, and employing $2,000 of your own money, you have a $2,000 equity or margin in the house, or in other words 20 per cent. If you give your broker $2,000 or 20 per cent. margin he will buy for you 100 shares of stock, and having bought it, your equity in the stock is 20 per cent. If the stock advances and you sell out, your profit is the difference between the buying and selling prices, less brokerage. If the stock declines and you sell out, the difference represents your loss. Brokers charge a compulsory fee of $12.50 for each 100 shares bought or sold, or one-eighth of 1 per cent. Traders who carry stocks on a margin are usually charged 6 per cent. interest on the amount involved.

A complete trade on the "bull" or "long" side of the market is effected in this way: You deposit your margin of 20 per cent. with a broker and request him to buy at the market (the best price obtainable), 100 shares of Union Pacific. The order is telephoned to the board and delivered to the floor member, who buys the lot for 100⅜ or $10,037.50. Adding

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your commission of one-fourth the stock costs you $10,062.50. The next day the broker receives the stock certificate from the man who sold it, and from the date of delivery you are charged interest, for the broker, if he does not use his own money for carrying it, borrows the cash from a bank and puts up the Union Pacific stock as collateral. In a week you elect to sell the stock at 110⅝, and your broker then obtains a check for $11,062.50, after having taken up the loan with the bank to secure a return of the stock which is delivered to the buyer. The profit would be $1,000 less interest. In the event of a decline, the difference between the buying and selling price as above figured would be your loss.

A complete "bear" or "short" trade would represent a sale of say 100 Union Pacific at 100⅜. Your broker sells the stock though he has none in his possession. At three o'clock, however, he borrows 100 shares from some other broker in the "loan crowd" who has or is "long" of the stock. The stock is delivered to your broker who takes it up by lending its cash market value to the man from whom it is borrowed. It is then delivered to the buyer of the 100 shares you sold. In a few days you close out your trade by buying back this stock in the open market, say at 90⅝, your broker receives the stock thus bought and pays for it; he then notifies the broker from whom he borrowed 100 shares that he will return it on the following day. The borrowed stock is returned and the lender also returns the amount of money received from your broker. This represents a complete "bear" operation. You withdraw your account and your broker pays back your margin increased or decreased as the case may be. There are of course many ramifications in stock trading, too long to justify detailed description.

*The Stock Exchange Clearing House.*—The hours for receiving and delivering bonds and stock certificates are from 10 A. M., to 2:15 P. M. Each transaction is compared before and after these hours by representatives of the principals to the transaction. All stocks bought and sold are not delivered though a large part are, but the Stock Exchange clearing house was organized to economize labor and the exchange of money. Had there been no clearing house in recent years, Wall street's machinery would have long since broken down under the strain. When a stock is sold for delivery the seller delivers the stock certificate which must be a "good delivery"; that is to say, the certificate is a genuine one, and the signature of the person in whose name the stock was issued is accompanied by the signature of a Stock Exchange member or firm as witness. On delivery the seller receives a check which his messenger certifies at the bank on which it is drawn, and it is then deposited in the seller's bank.

The clearing house is designed to obviate the delivery of stocks when possible, and so the active stocks are "cleared" through its machinery. Thus, if a broker buys 500 shares of stock and sells 500 on the same day, instead of receiving and delivering them in transactions involving possibly 11 firms in all and the exchange of 10 checks, he simply sends his statement to the clearing house with a check for the difference that he owes or a draft for the balance due him on his trades. The fundamental purpose of the clearing house is to enable each member to strike his balances precisely as if his dealings had been with a single other member. Members of the exchange are admitted to clear in their own names. Each member is assigned a number. Before 4:15 P. M., on every day except Saturday when the time is 1:15 P. M., "receive" and "deliver" tickets are exchanged by the different firms, and each broker sends the tickets received with his statement to the clearing house. The statement or sheet includes all trades in a large number of stocks, each separate security grouped together. All transactions are entered in one or two columns and a balance is struck. If the sheet shows a debit balance the difference is entered as a "balance" check, and the sheet must be accompanied by a check for the balance drawn on a clearing house bank; if, on the other hand, a credit balance is due, a draft for the amount on the clearing house bank is sent. The clearing house system is complicated and yet simple, requiring the employment of a large staff of accountants. It deals with exchanges and balances. Brokers may buy and sell 500,000 shares of a single stock in a day. If the first seller can deliver to the last buyer and eliminate the others in a "ringing out" process, a great saving in labor is accomplished. This the clearing house does—the entire list of deliveries due is assigned in correct proportion to the items in the list of receipts due, so that the clearing house books balance and every broker receives the stock to which he is entitled. Through the clearing house the members of the Stock Exchange were able to avoid certifying checks calling for $9,537,000,000 in the years 1888-1899, since which time stock dealings have enormously increased.

*The Arbitrage Trade.*—In the aggregate a small arbitrage trade is carried on between New York, Boston, Chicago and Philadelphia. Thus if Amalgamated Copper is selling at 125 in New York and 125½ in Boston, if it can be bought in New York and sold in Boston at the two

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prices named there is a profit of $50 on a trade of 100 shares, less charges. Such a business is transacted over private wires, and is a continual record of purchases and sales while frequent adjustments of the account are made possible by shipping stock certificates by express or registered mail so that the accounts can be evened up. Far more important and much more complicated is the arbitrage business between New York and London or Wall street and Lombard street. The first thing a broker asks when he gets down town in the morning is: "How is the London market?" London time is five hours ahead of New York, and therefore 9 A. M. here is 2 P. M. in London. At 9:15 Wall street has received its first news from London in the form of the two o'clock quotations, together with other prices, notably of consols, silver, discounts, etc. Feeling the London pulse sometimes furnishes the guiding force for the local market, and some years ago it was a much more important influence than it is today. The arbitrage houses get to work early over the cable, figuring prices, reducing messages by the cable codes and sending instructions. The difference in prices between the two markets affords the arbitrageurs their margins of profit. Suppose a London broker bought 100 Union Pacific common at a certain price in London, and sold it for one-half of 1 per cent., or $50 more, through his New York correspondent. If it were intended to make a round trade and deliver the stock in New York, the certificate would be shipped by steamer and the expenses would be: (1) expenses of shipment; (2) loss of interest on the money employed while the stock is in transit, and (3) interest on the stock borrowed here pending the arrival of the London stock. These items would have to be deducted from the one-half point profit. This is the general method, with the result that the two markets are seldom wide apart, for, when they are, sales or purchases quickly cause them to come together. As the first New York prices arrive in London as late as 3 P. M., there is one hour remaining in that market, for the London Exchange does not close till four o'clock. However, trading in "Americans" continues on the curb abroad till 6:30 or even seven o'clock. The arbitrage business is one calling for more skill than ordinary brokerage, and it is a singular fact that most of the firms engaged in it are composed of men of foreign birth.

*The Banks and the Brokers.*— The banks and the brokers are closely related. Big brokerage houses at times employ three depositing banks, and they are constantly in the market borrowing money on stock and bond collaterals. Money is borrowed on "time," which signifies for a specified period, or on "call," which means that the money can be "called" back from the borrower whenever the lender desires or the borrower can return the money at his convenience. Assuming that a broker is carrying 1,000 shares of stock for his customers on a 20 per cent. margin. The market value of the stocks is $100,000. He requests a loan from a bank, and usually 20 or 30 per cent. margin (to be maintained at all times) is required, and so we will assume that the broker borrows $70,000 on the stocks at the prevailing rate of interest, usually under 6 per cent. To carry the stocks it will be observed that he has $70,000 of the bank's money and $20,000 of the customers' money, leaving $10,000 to be accounted for, and that is where he uses his own capital. If the stocks decline rapidly the bank requests the broker to "margin up" his loan, and in turn the broker requests the customer to "margin up" his trade. It is a delicate operation, and it will be noted that the broker is always riding on the crest of the price wave, balancing himself carefully from day to day.

"Time" money is usually cheaper than "call" money. It will be noted that the broker, as a rule, charges customers 6 per cent. interest for carrying stocks, and that he borrows for 3 or 4. Unless the customer be a very important one the broker will shave the difference, and this interest account is one of the broker's most profitable sources of revenue. When times are panicky, and money is "scarce" and high, the brokers have to borrow on the Stock Exchange or send to the banks; but when the market is dull and easy and money is cheap, it is curious to see the money brokers calling at stock brokers' offices and almost begging them to borrow. Banks are also important to brokers in the matter of over-certifications. Thus, a broker may have $100,000 in a bank, and during the day before 2:15 P. M. has to receive and pay for $200,000 worth of securities. The bank agrees to certify his checks to the latter amount on the understanding that before three o'clock, having been paid in turn for his stock deliveries, he will deposit the $200,000 in the bank. Naturally, the banks are very particular about their collaterals, always preferring railroad to industrial shares. Sometimes in making loans the lending brokers specify the collaterals they require, but they are usually mixed loans, containing a very small percentage of "fancy" stocks or "specialties" which have had brief or erratic records on the Stock Exchange.

*The Telephone and the Telegraph.*— There are 500 telephones on the floor of the Exchange, each in charge of a boy who receives orders from his office and

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transmits them to the floor broker for execution. In every broker's office there are from 1 to 10 telephones, and many brokers rarely see their clients, who telephone orders from up-town offices, homes, or out of town. In recent years there has been an enormous growth of what are known as "wire houses." There are New York, Chicago or Boston firms which lease private wires connecting with many of the leading cities E. of Denver. No firm yet controls a private wire to the Pacific coast, but doubtless one will be heard of before very long. The private wire system of Wall street spreads out through the country like a gigantic web or fan. A private wire to Chicago costs $12,000 a year. About 25 private wires are leased by the American Telephone and Telegraph Company between Wall street and Chicago, and 50 between Boston and Wall street, and 30 between Wall street and Philadelphia. The Western Union and Postal-Telegraph Companies also lease many wires, but the copper wires of the telephone company are mostly used, as they are not so susceptible to break-downs during storms, and they can be readily transformed into long-distance telephones. Should there be any important news, and conversation is preferable to a written message, the brokers in a very few minutes can talk from Wall street to Chicago or Boston over their private wires, and every afternoon there is a vast amount of business transacted by word of mouth between Wall street and the cities it taps with leased wires. Many of the long wires also connect with the intervening cities. Thus Buffalo, Cleveland, Toledo and other cities may be "on" a Chicago wire, and each pays a share for the service.

This is the most expensive part of a broker's business, for "wire" houses employ from 1 to 15 telegraph operators, the most expert being employed and usually receiving $25 each per week. Speed and accuracy are the important considerations. An order to buy or sell on the New York Stock Exchange can be sent from Chicago and executed in four minutes. From Chicago quotations are sent at short intervals over the public wires to San Francisco, Seattle and other far Western cities.

*Stock Quotations.*— The Stock Exchange floor is divided into a seemingly confused but very orderly "crowd." Each crowd trades before a "post" holding an adjustable quotation board on which the last price is shown by a turn of the hand. The crowds are large or small, as the stock dealt in is a favorite or happens to be inactive. Sugar, for example, is a favorite, and ordinarily the "crowd" contains a large number of shouting, gesticulating brokers. In this crowd is a sharp-eyed, cold-blooded telegraph operator. He notes every sale on a pad, with the eyes and the ears of an expert. As he gets the sales he telegraphs each one to a central office near the Stock Exchange where they are rapidly relayed over the telegraph wire circuits connecting with the stock indicators or "tickers" as they are known. The ticker is a little mechanical printing machine enclosed in a glass case. It is an ingenious combination of wheels, steel springs, letters of the alphabet and numerals. Quotations are printed like this:

N P E

300, 156. 200, 156½ . . . 200, 41.

Interpreted this means 300 Northern Pacific, common, sold at $156 a share, 200 at $156½, and 200 Erie at $41 a share. Each stock in order to hasten the delivery of quotations has an abbreviation, and these abbreviations lead to nicknames, such as "Mop" for Missouri Pacific, "Cheapest, Best and Quickest" for Chicago, Burlington and Quincy, "Post Office" for People's Gas, and many others. In the bull market the two quotation companies had to discontinue printing fractional lots and even then they were far behind time. On the day of the panic the tickers printed quotations 18 minutes after three o'clock — the longest time on record. Ordinarily the printed sale follows the actual transaction in from two to five minutes.

*How Wall Street Gets the News.*— Wall street has three news bureaus: those of Dow, Jones and Company, the New York News Bureau and the J. Arthur Joseph Bureau. The first two have elaborate systems for the distribution of news. They handle news more quickly than any newspaper and there is no place in the world where newspaper speed and accuracy have reached such a degree of perfection. Each news bureau has a staff of reporters, a telegraph and cable service, and each distributes the news printed on small sheets of paper, one using yellow and the other white slips. Messengers run with the slips to the brokers' offices. Each messenger has a route to serve and each service tries to outstrip the other. The result is that long before the afternoon papers appear, the brokers have read all the financial news and bulletins of the general news of the day from the "slips." The slips begin to be delivered at the broker's office at about nine o'clock. Opening with a review of the market, the London quotations and general financial and other news follow in quick succession, till at three o'clock in unending procession, slips have been received to the number of 100, 200 or more. In order to provide even greater speed each bureau maintains a page printing electric ticker service. For $30 a month you get the news slips and a news ticker which prints the bulletins of the leading events before they can be delivered on the slips.

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Both news bureaus publish daily papers —the "Wall Street Journal" and the "Wall Street Summary"—and there are about a half-dozen other financial papers, including the "Journal of Commerce," "New York Commercial," "Daily Stockholder" and "Wall Street News." Each daily paper in New York city supports a Wall street staff of from two to six men. Wall street depends for its printed statistics on the "Financial Chronicle," "Wall Street Journal" and "Poor's Manual," three American institutions that occupy places in the machinery of a broker's office.

*Cost of Conducting a Brokerage Firm.*—It is estimated that 300 representative commission houses pay expense bills that aggregate $15,000,000 a year. This, however, is only a part of the bill that the public pay for buying and selling stocks. The most expensively conducted firm in Wall street was that of Price, McCormick and Company, which failed in 1899 with liabilities of $16,000,000, the yearly expenses being figured at $1,000 a day or $300,000 a year. Employing about 200 men, and carrying on a most extensive wire and branch office business, it became insolvent owing to an abortive attempt of a member of the firm to effect a corner in cotton. This concern occupied three floors of one building, and traded in stocks, bonds, grain and cotton; it was represented on the Stock, Cotton and Produce exchanges of New York; the Board of Trade of Chicago, and the New Orleans and Liverpool Cotton exchanges.

A dozen concerns each employ from 40 to 60 men and the smallest about five. A man about to organize a brokerage office recently sent for an efficient manager and said: "I would like to know how much it will cost to run an office for a year, even if I don't take in 100 shares of business." The reply was: "From $50,000 to $75,000." Of course there are commission firms which manage to transact a limited trade on an expenditure of $8,000 or $10,000. Rents range from $600 to $25,000 and even more. Firms usually consist of two or more members. There is the board member and an office manager.

*Bucket Shops.*—There are many bucket shops in Wall street which advertise for trade, and a greater number maintain offices there, and operate wire circuits extending through New England, New York, Pennsylvania and the West. A bucket shop is conducted by an individual or firm and from 5 to 100 shares and larger lots of stock are dealt in. The theory of the bucket shop keeper is that 90 per cent. of the traders in stocks lose money, and they back their customers to "guess wrong," or in other words they trade on Stock Exchange quotations. Thus if a man buys 10 shares of St. Paul in such a place the concern wagers that he will lose. If he wins the bucket shop pays the loss out of its capital; if he loses the bucket shop pockets the margins. There is one powerful bucket shop in Wall street which accepts no local trade but conducts a system of offices throughout the country. It employs 12 or 15 telegraph operators who from 10 A. M. to 3 P. M. send the quotations as fast as they are posted on a big blackboard. The Stock Exchange endeavors to prevent them from getting quotations, but they pay liberally for the service they require and never fail to get it by "greasing" the proper machinery. The big bull market ruined hundreds of bucket shop men. The only time they lose is during steadily rising prices, and since 1898 they have had a hard struggle. In an irregular or rapidly changing market, "weak" succeeding "strong" days, the bucket shop men reap harvests. They always urge their customers to buy stocks, and if they get a large following in any one stock they will not hesitate to enter the Stock Exchange market by sending legitimate orders to a broker to sell a certain stock down five points in order to "wipe out' the customers' margins. Some of the more powerful have been known to secretly buy Stock Exchange seats for their representatives and use them for this purpose, and also to "hedge" on their contracts. "Hedging" means that if a bucket shop is short say 5,000 shares on a rising market that amount will be bought on the regular exchange as insurance against loss. One of the biggest of the New York bucket shops not only lost all its capital in April but its owner had to mortgage his town and country houses. He was then forced to borrow on his note and had the rise continued a week longer he would have been insolvent; but the panic enabled him to clean up $250,000, on which he proposes to retire and seek rest in Europe.

*The Consolidated Exchange.*—The Consolidated Exchange, called the "Little Board," is composed of quite a large membership of men who appeal to the "small fry" speculators. They trade on Stock Exchange quotations, and recognize that institution as the primary market. One of the mysteries of Wall street is how they get the quotations which are posted on a 100-foot blackboard as soon, almost, as they are made by their big rival. But get them they do, and they transact a large business in fractional lots of 10 shares and upward. As there are 10 persons who wish to trade in lots of 10 shares where one wishes to trade in 100, this trade in the aggregate reaches large proportions. Then, too, though the Stock Exchange expressly forbids its members having business relations with members of

the Consolidated, an active arbitrage business is conducted between the two boards, for prices are frequently one-half per cent. apart. The Consolidated Exchange has lost many clever brokers who sought a wider field in the big exchange.

*Rogues of Wall Street.*— The rogues of Wall street flourish. They are thieving brokers, promoters of mining schemes and disreputable speculators. Said a thieving broker on one occasion: "If the postoffice department would only let me alone I would have to hire a cart to carry down my money-laden mail. All you have to do is to appeal to the cupidity of the public. Promise 6 per cent. dividends on a first-class security, and you can't do business; but promise 56 per cent. on a fake, and I can get rich."

For $5 a week, he will tell you precisely how to make a fortune. He advertises in strange ways using a ridiculous code. For example: "Hit a Kangaroo for a jump of 20 points," etc. This interpreted means buy a certain stock for an advance of $20 a share. Such men are swindlers. Quite as contemptible is the man with a fake gold, silver, zinc, copper or oil mining scheme. He first buys a mining prospect for say $2,500, and then organizes a $500,000 or $1,000,000 company under the laws of New Jersey or West Virginia for say $2,500 more. The shares have an alleged par value of $1 each but he offers them for 37 cents each from an elaborately furnished office where he poses as the fiscal agent. The rogue who selects the broker as his victim is more common than the brokers are willing to confess.

*The Messenger Service.*— Wall street wheels would stop going round if all its messenger boys should ever go on strike. The total number must be from 5,000 to 10,000. They are the brightest and quickest messenger boys on the face of the earth. "Hurry" is in the Wall street atmosphere and they make haste with their work which calls for nimble wits and rapidity of physical action. The duties of the Wall street boys are manifold; they compare stock transactions, make bank deposits, certify checks, transfer and deliver stocks, carry important orders, and they must be able to locate instantly 1,500 different offices in the Wall street district.

**Walnut,** a genus comprising seven or eight species of beautiful trees of the natural order *Juglandaceæ*. All are trees with alternate pinnated leaves, monœcious flowers, and a drupe-like fruit, with a deciduous fleshy husk, which bursts irregularly, and a deeply wrinkled shell (*putamen*) of two valves, within which is the seed, curiously lobed and wrinkled, with a membranaceous testa and partial dissepiments. The common walnut (*J. regia*) is a native of Persia and the Himalayas, but has long been cultivated in all parts of the S. of Europe. The date of its introduction is unknown, but it was certainly cultivated by the Romans in the reign of Tiberius. It is a lofty tree of 60 to 90 feet, with large spreading branches. The leaves have two to four pairs of leaflets, and a terminal one. They have a fine balsamic odor when bruised; this quality, however, being much more marked in some trees than in others. An infusion of them has been found useful in scrofula; when bruised and rubbed on the skin they are efficacious in curing itch; and placed in wardrobes they prevent the ravages of moths. The sap is limpid like water, but contains much sugar, so that the tree is sometimes tapped for it, like the sugar

WALNUT.

a, nut; b, seed.

maple, and the sugar is procured by evaporation; a pleasant kind of wine is also made from it. An excellent pickle and a kind of ketchup are made from the unripe fruit. The ripe fruit is one of the best of nuts, and is an important article of export from many parts of the S. of Europe. Walnuts are also exported in large quantities from Kashmir and other Himalayan regions to supply the markets of India. In the S. of Europe walnuts are a very considerable article of food, and when perfectly fresh they are wholesome and nutritious, though in the state in which they are imported into Great Britain they are not easily digestible. Just before they are ripe they are much used in France with vinegar, salt, pepper, and shallots. Among the varieties of walnut in cultivation is one with a very thin shell, which is much esteemed.

Walnuts yield by expression a bland fixed oil, which, under the names of walnut oil and nut oil, is much used by painters as a drying oil, and in the countries in which it is produced is a common article of food. The cake left after the expression of the oil is sometimes used as an article of food,

and is also used for feeding cattle and poultry. The timber of the walnut is of great value, and is much used by cabinet makers. It is light, though hard and fine-grained; and gun stocks are made of it. The wood of young trees is white, and little esteemed; that of old trees is brown, veined and shaded with darker brown and black. The wood of the roots is beautifully veined. Both the root and the husks of the walnut yield a dye, which is used for staining light-colored woods brown. The walnut, when meant to become a timber tree, is best sown where it is to remain, as the roots are much injured by transplanting. The best kinds of walnut for fruit are generally grafted. The walnut succeeds well in Great Britain as an ornamental tree, even in the N. of Scotland, although it seldom quite ripens its fruit except in the warmest parts of England. The names in Teutonic lands indicate that it passed into Northern Europe from Italy and France. Very similar to the common walnut is the black walnut (*J. nigra*) of North America, found in most parts of the United States. It is a very large and beautiful tree, the trunk sometimes 6 or 7 feet in diameter; its leaves have more numerous leaflets than those of the common walnut. The timber is even more valuable than that of the common walnut. The butternut (*J. cinerea*) is abundant in the N. and N. W. States of North America, and in Canada. It is a tree only about 50 feet high, with trunk about a foot in diameter; leaves with 15 to 17 leaflets; the fruit elongated, and externally covered with a viscid substance. The nut is hard and rough, with prominent ridges, and of good quality. The wood is not apt to split or warp, and is useful for many purposes. Sugar is obtained from the sap, as from that of the maple, but is of inferior quality.

**Walpole Horace, Earl of Orford,** an English author, 3d son of Sir Robert Walpole; born in London, Oct. 5, 1717; was educated at Eton, and King's College, Cambridge, on leaving which he traveled two years on the Continent in company with Gray the poet. Returning in 1741 he entered the House of Commons and sat for various constituencies up to 1768. He always took a lively but superficial interest in politics, inclining sentimentally to extreme opinions. In 1747 he purchased

HORACE WALPOLE.



"Strawberry Hill," near London, where he erected a Gothic villa, laid out the grounds with minute ingenuity, and made it a principal business of his life to adorn and furnish it with objects of curiosity and antiquarian interest. His maintenance was provided for by some sinecure appointments. In 1757 he established a private printing press at "Strawberry Hill," at which he printed not only his own works but those of others. In 1791 he succeeded his nephew in the peerage. He never took his seat in the House of Lords, and appears to have avoided using his title. The works of Horace Walpole are numerous; but his fame as a writer rests on his "Letters" and "Memoirs." The former are held to be unsurpassed in the English language, and both are highly interesting and valuable as a storehouse of the more evanescent traits of contemporary history. His romance, "The Castle of Otranto," is also well known. He died in London, March 2, 1797.

**Walpole, Sir Robert, Earl of Orford,** an English statesman; younger son of Sir Robert Walpole; born in Houghton, England, Aug. 26, 1676; was educated at Eton, and at King's College, Cambridge; succeeded to the paternal estate in 1700, and entered Parliament as member for Castle Rising. In 1702 he was elected for King's Lynn, became an active member of the Whig party, and soon distinguished himself by his business capacity, and by his debates. In 1712 he was expelled from Parliament for breach of trust and corruption, and sent to the Tower, but was returned to his seat the following year. He was Secretary of War and leader in the House of Commons in 1708, paymaster of the forces in 1714 and 1720, and first lord of the treasury and chancellor of the exchequer in 1715, and again in 1721, and prime minister from 1715–1717 and from 1721–1742. During his long administration the Hanoverian succession, to which he was zealously attached, became firmly established, a result to which his prudence and political sagacity largely contributed. He relieved the weight of taxation by many improvements in the tariff. In 1724 he was

SIR ROBERT WALPOLE.

made a Knight of the Bath, in 1726 a Knight of the Garter, and in 1742 was created Earl of Orford. An able monograph on Walpole has been published by John Morley. He died in Houghton, England, March 18, 1745.

**Walpole, Spencer,** an English historian; born Feb. 6, 1839. He held several government positions. Among his books are: his greatest work, "A History of England from the Conclusion of the Great War in 1815" (1878–1886); "The Electorate and the Legislature" (1881); "Life of Lord John Russell" (1889); "The Land of Home Rule" (1893); and "Foreign Relations." He died July 7, 1907.

**Walpurga, Walburga, or Walpurgis,** a female saint; born in England early in the 8th century, died 779. She was for many years a nun in a Dorsetshire convent. As a niece of St. Boniface, and sister of St. Willibald, first bishop of Eichstädt, Bavaria (741–786), she was induced to proceed to Germany to found convents, and in 754 she became abbess of Heidenheim, a convent within her brother's bishopric. She died at the latter place, but was buried at Eichstädt, and her shrine was visited by many pilgrims and was the scene of many miracles. Though her feast properly falls on Feb. 25, the eve of May 1, associated with some of the most popular of the witch superstitions of Germany, is called Walpurgis' Night. On that night witches were believed to ride through the air on broomsticks, etc., to some witch hill where they held a rendezvous with the devil. Such meetings were called the "Witches Sabbaths." The most famous witch hill was the highest part of the Hartz Mountains, called the Brocken or Brocksberg. The Beltane or Beltain festival was observed in Scotland and Ireland on the same date. See BELTANE.

**Walrus,** in zoölogy, the *Trichechus rosmarus,* called also the morse, seahorse, and sea cow. The walrus is now confined to the regions within the Arctic Circle, though its extinct ancestors had a much wider geographical range. It is a large carnivorous marine mammal, ordinarily from 10 to 12 feet long, with a girth of nearly as much; it is said that it sometimes attains a length of 20 feet; muzzle abruptly truncated, with long and remarkably strong bristly moustaches; small eyes; external ear wanting, though the orifice is distinctly visible; body large and sack-like, tapering toward the tail; hind limbs short, connected by a membrane which covers the tail, fore limbs strong and stumpy, all with five digits. The hide is of a tawny brown color, with difficulty penetrated by bullets, and has been likened to a tough, flexible coat of mail. The upper canines are developed in adults of both sexes into immense tusks, each from 15 inches to 2 feet long and weiging 10 pounds and upward. In some individuals the points converge toward, and in others they diverge from each other. The most important function of these tusks is digging shell fish, the favorite food of the walrus, out of the banks and mud of shoal water. They also raise the body out of the water, by digging into ice floes, which probably gave rise to the legend of the rosmarine; and they form terrible weapons of offense, as by a quick turn of the neck the animal can strike upward, downward, or sideways with equal

WALRUS.

dexterity. Walruses are gregarious, and are found on the seashore and on ice floes; some keep guard while those of the main body sleep, and when danger threatens the sentinels awaken the others by bellowing. They are said to be monogamous, and the female brings forth at nine months one calf, usually on the ice floes. In disposition they are quiet and inoffensive, unless attacked or during the love season, or if their young are in danger; when they become desperately aggressive, and furiously attack the hunters on the ice or in boats. The numbers of the walrus, owing to reckless slaughter by sealers and whalers, are fast decreasing, and the few remaining seek unfrequented spots in high latitudes inaccessible to sealers. At one time there was a considerable trade in walrus hunting, but it is now at a very low ebb; the tusks alone have any commercial value at the present time; but formerly walrus hides were used for various purposes, such as machine bands, etc.

**Walsall,** a town of Staffordshire, England; 8 miles N. N. W. of Birmingham. It is situated on a small affluent of the Tame, and has good public buildings, including a Guildhall (1867), an Agricultural Hall (1868), a new church of St. George (1875), and a Cottage Hospital, opened in 1878. The special manufactures are saddlers' ironmongery and all kinds of leather goods (saddles, harness, etc.), the latter being largely exported to the colonies. There is much tanning, currying, bridle cutting, and making of coachbuilders' furniture and

fancy leather wares. Walsall lies on the margin of the Southern Staffordshire mineral field, and produces a great variety of hardware, small castings, gas tubes, chandeliers, iron bedsteads, silver and brass plating, etc. Coal and lime are wrought in the vicinity. Pop. (1901) 86,440.

**Walsh, Henry Collins,** an American journalist; born in Florence, Italy, Nov. 23, 1863; was graduated at the University of Georgetown, D. C.; engaged in newspaper work; was on the editorial staff of various newspapers and on that of the "International Cyclopædia"; traveled in the Arctic regions, Central America, Morocco, and other countries. During the American-Spanish War he was war correspondent for the New York "Herald," and later was placed on the Sunday staff of that paper. His publications include "By the Potomac, and Other Poems" (1899); "The Last Cruise of the Miranda, a Record of Arctic Adventure" (1896); etc.

**Walsh, Robert,** an American author; born in Baltimore, Md., in 1784. In 1837 he removed to Paris, where he was consul in 1845–1851. He wrote for "Dennie's Portfolio," and edited the "American Review of History and Politics," the first American quarterly (22 vols. 1827–1837); most of the articles were from his pen. Others of his publications are: "Correspondence Respecting Russia Between R. G. Harper and Robert Walsh, Jr." (1813); "An Essay on the Future State of Europe" (1813); biographical prefaces to an edition of the English poets in 50 small volumes; "An Appeal from the Judgments of Great Britain Respecting the United States of America" (1819). He conducted the "American Register" (1817–1818), the "National Gazette" (1821–1837), and the "Museum of Foreign Literature and Science" (vol. i. 1822); and edited "Didactics: Social, Literary, and Political," a collection of aphorisms (2 vols. 1836). He died in Paris, Feb. 7, 1859.

**Walsh, William Shepard,** an American journalist; born in Paris, Feb. 1, 1854, son of Robert. He was connected with J. B. Lippincott & Co. from 1876 and in 1886 became editor of "Lippincott's Magazine." He wrote many essays, also juveniles, and historical and scientific books for the young; and published a critical commentary, "Faust: The Legend and the Poem" (1887); "Paradoxes of a Philistine" (1888); and "Handy Book of Literary Curiosities" (1892).

**Walsingham, Sir Francis,** an English statesman; born in Chiselhurst, England, about 1536. After studying at King's College, Cambridge, he traveled on the Continent for some time, and acquired a good knowledge of foreign languages and politics. He was introduced by Cecil, Lord Burleigh, to public service, under Queen Elizabeth, and employed in embassies to France, the Netherlands, and Scotland. He also sat in the House of Commons for various constituencies, was knighted, made a member of the Privy Council, and one of the principal secretaries of state. The unraveling of the Babington plot against Queen Elizabeth was intrusted to Walsingham, and he was also one of the commissioners who tried Queen Mary. He died in Born Elms, near London, April 6, 1590.

**Walter, Ferdinand** (väl'ter), a German jurist; born in Wetzlar, Prussia, Nov. 30, 1794. His principal works are: "Text-Book of Canon Law" (1822); "Ancient German Law" (3 vols. 1824); "History of Roman Law Down to Justinian" (1840); "History of German Law" (1853); "Sources of Ancient and Modern Ecclesiastical Law" (1862); "Natural Law and Politics in the Light of the Present" (1863). He died in Bonn, Dec. 13, 1879.

**Walter, Thomas Ustick,** an American architect; born in Philadelphia, Pa., Sept. 4, 1804; began the study of architecture in the office of William Strickland, with whom he remained till 1830, when he engaged in independent practice. His first important work was the Moyamensing penitentiary, built in 1831. In 1833 he made the designs for the Girard College building, which on its completion in 1847 was pronounced the finest specimen of classic architecture in the United States. His next great work was the breakwater at Laguayra for the Venezuelan government. In 1851 his design for the extension of the National Capitol at Washington, D. C., was adopted. Having been appointed government architect, he removed to Washington, and remained there till the completion of the work in 1865. While in Washington he also designed the extensions of the patent office, treasury, and postoffice buildings, the dome of the Capitol, and the Government Hospital for the Insane. He was a member of the American Philosophical Society, and an original member of the American Institute of Architects; and was also Professor of Architecture in Franklin Institute and lecturer on architecture in Columbia College. He died in Philadelphia, Pa., Oct. 30, 1887.

**Walters, William Thompson,** an American merchant and art virtuoso; born in Pennsylvania, May 23, 1820; was educated as an engineer; became identified with the coal and iron industry; was art commissioner from the United States at the Paris Expositions (1867–1878), at Vienna (1873), and trustee of the Corcoran Gallery at Washington, D. C. His private art gallery was the most extensive and valuable (especially in Oriental ceramics) in the United

States. He annually gave exhibitions of his pictures, for charity, $30,000 being thus realized and given to the poor of the city. He published: "Barye" (1885); "The Percheron Horse" (1886); and "Notes Upon Certain Masters of the 19th Century" (1886). He died in Baltimore, Md., Nov. 22, 1894.

**Walthall, Edward Cary,** an American lawyer; born in Richmond, Va., April 4, 1831; received a fair education and was admitted to the bar in 1852; began practice in Coffeeville, Miss.; was district attorney for the 10th Judicial District of Mississippi in 1856–1861. He then resigned and was made lieutenant in the 15th Mississippi Infantry; was promoted lieutenant-colonel, and led his regiment in the action of Mill Springs, or Fishing Creek, Ky., Jan. 19, 1862; was promoted Brigadier-General in December, 1862, and Major-General in June, 1864. He especially distinguished himself during the battle of Missionary Ridge, where he led his brigade over a ridge and held back the National troops till the Confederate army made its escape; and covered the retreat of General Hood's army after the defeat at Nashville. He was in law practice in Grenada, Miss., in 1871–1885, when he was appointed a United States Senator to fill out the unexpired term of Lucius J. C. Lamar; was elected for full terms in 1888 and in 1892. He was chairman of the Committee on Military Affairs, and served on the Committees on the Improvement of the Mississippi River and on Public Lands. He died in Washington, D. C., April 21, 1898.

**Waltham,** a city in Middlesex co., Mass.; on both sides of the Charles river, and on the Fitchburg and the Boston and Maine railroads; 10 miles W. of Boston. It contains a public library, the Leland Home for Aged Women, a hospital, Home for the Feeble-minded, waterworks, street railroad and electric light plants, National and savings banks, and several daily and weekly newspapers. The city is widely known for its manufacture of watches, for which there are two establishments, one of which is the largest watch factory in the world, in which watch making by machinery on an extensive scale was first attempted. Here also was built the first cotton mill in the United States where all the operations of cotton manufacture were conducted under one roof. The other industries include the manufacture of crayons, hosiery, electric clocks, etc. The assessed property valuations exceed $20,000,000. Pop (1890) 18,707; (1900) 23,481; (1910) 27,834.

**Waltham,** a market town of Essex, England; on the Lea; 13 miles N. by E. of London. Called also Waltham Abbey and Waltham Holy Cross, it retains the nave of a stately Norman church, which, rebuilt by Harold in 1060 for a collegiate chapter, served from 1177 for an Augustinian abbey. A miraculous cross had been brought here from Montacute in Somerset; and here probably Harold was buried. Both the nave and a Decorated lady chapel have been restored; they serve for the parish church, of which Bishop Hall and Thomas Fuller were incumbents. Waltham has memories also of Cranmer and Henry VIII. Waltham Cross is 1¼ miles W. in Hertfordshire; and 1 mile farther W. is Theobalds. The Lea's many channels form a network of islands, on which are vast gunpowder mills belonging to the government. Enfield, in Middlesex, is also near; and market gardening is largely carried on. Pop. (1901) 6,547.

**Waltheria** (named after Prof. A. Walther, of Leipsic), a genus of *Hermanneæ;* herbs or shrubs with serrated leaves, some stellate hairs, and axillary or terminal heads generally of yellow flowers. Calyx persistent, campanulate, five-cleft, surrounded by a one to three-leaved deciduous involucel; petals five, stalked; style somewhat lateral; stigma fringed or tubercled; fruit capsular. *W. douradinha,* which abound in mucilage, is used in Brazil in diseases of the chest, and externally as an application to wounds; and *W. americana* in Surinam in fevers.

**Walther von der Vogelweide** (fō'gl-vī-de), the most eminent of the old German lyric poets of the class of Minnesingers; born about 1170. His earliest patrons were Duke Leopold VI. of Austria and his son, Frederick. Subsequently he visited for shorter and longer periods, the courts of most German princes, who were in favor of an imperial as against a papal policy. The Emperor Frederick II. provided him with a small estate near Würzburg, where he seems to have always retired when disgusted with traveling, the courts, and intrigues. He was a politician and reformer as well as a poet, and his verses breathe a liberalism far in advance of his times; while the subjects of his favorite love songs are noble women. He died in Würzburg, about 1230.

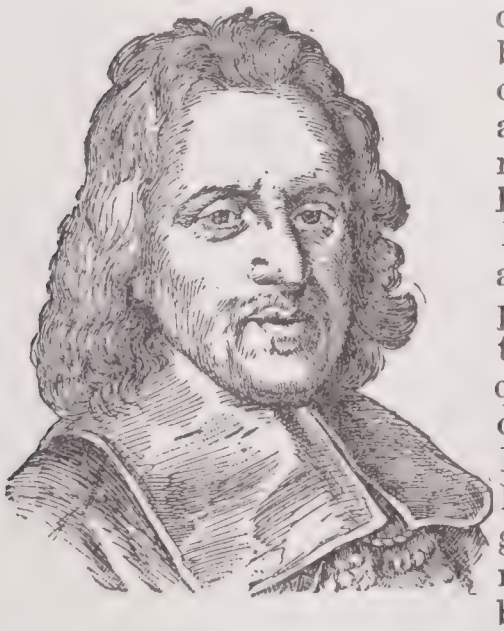
**Waltner, Charles,** a French etcher; born in Paris, France, March 24, 1846; studied painting under Gérôme; but, after working as a copperplate engraver, found his true vocation in etching. He became famous by etchings after Rembrandt, Rubens, Van Dyck, and Velazquez; among his best-known etchings are those of Millet's "Angelus," and Munkacsy's "Christ Before Pilate."

**Walton, Brian,** an English Biblical scholar; born in Seymour, Yorkshire, England, in 1600. He was made chaplain to Charles II. and Bishop of Chester at the

Restoration. His greatest work is "Biblia Sacra Polyglotta" (6 vols., folio 1657), including the Hebrew original of the Old Testament, the Samaritan Pentateuch, the Chaldee, Syriac, Arabic, Persian, and Latin Vulgate, with various readings, notes, etc.; still thought to be "the most complete Biblical apparatus in any language." He wrote in 1658 his "Dissertation on the Antiquity and Authority of His Texts," in later editions called the "Prolegomena," under which name it was published in the original Latin (2 vols. 1827–1828). "The Considerator Considered," etc. (1659), was written in answer to Dr. John Owen's "Vindication of the Purity and Integrity of the Hebrew and Greek Texts," etc., which was a criticism on his great Biblical work. He died in London, Nov. 29, 1661.

**Walton, George,** an American patriot; born in Frederick co., Va., in 1740; studied law and was admitted to the bar in 1774; began practice the same year in Augusta, Ga. On July 27, 1774, with three others he called a public meeting in Savannah to consider certain public grievances, and was made a member of the committee to urge the various parishes to join the other provinces in resisting the arbitrary claims of Great Britain; was also on the committee which drew up a petition to the king. In 1776 he was one of the signers of the Declaration of Independence, and was a delegate to the Continental Congress from that year till October, 1781; was elected governor of Georgia in 1779 and 1789; was chief-justice of the State in 1783, 1787, and 1793; and United States Senator in 1795-1796. He died in Augusta, Ga., Feb. 2, 1804.

**Walton, Izaak,** an English author, known as the father of angling; born in Stafford, England, Aug. 9, 1593. About 1623 he was carrying on business on his own account as a sempster or man milliner in London, and having by 1643 acquired a competency, he retired to the quiet enjoyment of country life. His first wife, Rachel Floud, great grandniece of Archbishop Cranmer, having died in 1640, he married about seven years later Ann Ken, whose brother, at that time a mere boy, afterward became the famous bishop. In London Walton had become intimate with Dr. Donne, Dr. Wharton, and Sir Henry Wotton, and in his later years he enjoyed the hospitality of many eminent clergymen of the Church of England. Walton's fame is mainly based on his "Compleat Angler; or the Contemplative Man's Companion," which was first published in 1653 and appeared in a considerably modified form in 1655. Few more popular books exist, and the editions are consequently numerous. Walton's natural history is frequently of the crudest and most credulous kind; his practical precepts are open to correction at the hands of the modern proficient; he possesses only a partial mastery over the difficult literary form (that of the dialogue) in which his work is cast; his style is remarkable neither for rugged strength nor polished precision; but he succeeded in catching the spirit both of the gentle craft and the pleasant English scenery in which he had learned its delights. On the publication of Dr. Donne's "Sermons" Walton supplied a "Life" of the author, and he afterward wrote similar lives of Wotton, Hooker (1665), Herbert (1670), and Sanderson (1678). A monument to Walton was placed in St. Mary's Church, Stafford (the church of his baptism), in 1878. He died in Winchester, England, Dec. 15, 1683.



IZAAK WALTON.

**Waltz,** a dance said to have originated in Bohemia, now of almost universal adoption. It is performed by couples, who, almost embracing each other, swing round the room with a whirling motion. Also, the music composed for such a dance. The time is of triple measure in crotchets (quarter notes) or quavers (eighth notes), and consists of 8 or 16 bar phrases. Modern waltz-writers frequently add to their original dance-form an introduction and coda. The "Vienna" waltz is characterized by a rapid movement and strict unbroken time. Ländler are slower and more dignified than the waltz. "Classical waltzes" are compositions in waltz form intended for set pieces, not for dance tunes. In them greater scope is given to the composer and performer than is compatible with the rhythm of the dance.

**Walworth, Clarence Alphonsus,** an American clergyman; born in Plattsburg, N. Y., May 30, 1820. At first a lawyer, afterward an Episcopalian clergyman, he united with the Roman Catholic Church, and was one of the founders of the Congation of St. Paul; became in 1864 rector of St. Mary's Church, Albany, N. Y. He wrote: "The Gentle Sceptic" (1860); "The Doctrine of Hell" (1874); "Andiatorocté, and Other Poems" (1888). He died in Albany, N. Y., Sept. 19, 1900.

**Walworth, Ellen Hardin,** an American author; born in Jacksonville, Ill., daughter of Gen. John J. Hardin and widow of Mansfield T. Walworth; was president of the Shakespeare Club at Saratoga in 1875–1878; president and founder of the Art and Science Field Club in that city in 1880–1885; founder of one of the three National Societies of the Daughters of the American Revolution in 1890; director-general of the Woman's National War Relief Association in 1898; one of the first three women elected to the School Board under the New York law; and founder and later president of the Post Parliament in New York. She was also a life member of the American Historical Asociation, a fellow of the American Geographical Society, and a member of the New York Genealogical and Biographical and the New York Historical Societies. Her publications include: "Battles of Saratoga"; "Parliamentary Rules"; "Preservation of National Archives"; "Proceedings of the American Historical Association"; "Field Work for Amateurs"; "Proceedings of the Society for the Advancement of Natural Science"; etc.

**Walworth, Jeannette Ritchie Hadermann,** an American novelist; born in Philadelphia, Pa., Feb. 22, 1837. She wrote for periodicals, and published a number of works, among them: "The Silent Witness" (1871); "Nobody's Business" (1878); "The Bar Sinister" (1885); "Southern Silhouettes" (1888); "Baldy's Point"; "An Old Fogy"; etc.

**Walworth, Mansfield Tracy,** an American novelist; born in Albany, N. Y., Dec. 3, 1837. Abandoning the law for literature, he became connected with "The Home Journal," and subsequently wrote many novels and romances. He was shot by his son, who was acquitted on the ground of insanity. He wrote: "Mission of Death"; "Lulu" (1860); "Hotspur" (1861); "Warwick" (1868); "Beverly" (1873); and two posthumous works, "Married in Mask" (1888) and "Tahara" (1888). He had completed a "Life of Chancellor Livingston"; and was writing "Lives of the Chancellors of New York State." He died in New York city, June 3, 1873.

**Wampee,** in botany, the fruit of *Cookia punctata.* It is a round berry about the size of a pigeon's egg, with five or a smaller number of cells. It is highly esteemed in China and the Indian Archipelago.

**Wampum,** the American Indian name for beads made of shells, formerly used as money, or as a medium of commerce. They were also united to form a broad belt, which was worn as an ornament, and was called wampumpaque, or wampeaque. The manufacture of wampum is carried on among the Germans living in the hills of Bergen co., N. J. The interior of a wampum workshop resembles a limekiln. The floors are hidden from sight by great heaps of shells, and the rude benches and tools are covered entirely with white-flying dust as the shells are being ground and drilled, and suggests the application of innumerable coats of whitewash, which in fact it really is.

The wampum makers purchase a cartload of conch and clam shells for 25 cents, delivered at their doors, and when a shell of sufficient thickness is selected it is broken with hammer and chisel into cubes of about two inches in length and one-third of an inch square. This piece of shell is then securely wedged into a vise made of two pieces of wood connected with a hinge in the center. The jaws of the vise are opened and the shells inserted. Then the vise is closed tightly and held by pressure against the grindstone. In this manner, in a short time, the edges of the shell are rounded, and then the drill is brought into use.

The workman sits at a three-legged table, the top of which is fashioned from the half of a log, the under side still retaining the original bark covering, and, affixing one end of the drill to play freely in a button on his jacket, he next takes up a whalebone bow, similar to the kind used by jewelers, and, giving the cord a turn about the spool on the drill, he works the bow rapidly back and forth, from right to left, till the sharp end of the drill penetrates through the cube of shell from end to end lengthwise. When a sufficient number of cubes are completed they are then smoothed and polished with emery paper and strung on wires, precisely the same as children string beads, and they are then ready for the market, The wampum that is made from the streaked, bluish parts of hard-clam shells is the most beautiful, and therefore more valuable, and is harder and tougher to work. The price paid for the products of this almost obsolete industry is 14 cents a running inch on the string, and the average amount of money made by these shell artisans is about $6 a day during the season.

**Wanamaker, John,** an American merchant; born in Philadelphia, Pa., July 11, 1838; began his career as an errand boy in a bookstore; was afterward employed as a retail clothing salesman; and in 1861 established with Nathan Brown, the clothing house of Wanamaker & Brown, in Philadelphia. In 1869 he founded a large apartment store in that city and subsequently converted the A. T. Steward building on Broadway, New York, into a similar store. In 1889–1893 he was Postmaster-General. He was long active in religious work, and early founded the Bethany Presbyterian Sunday-school, in Philadelphia, which soon became one of the largest in the United States.

**Wandering Jew.** See JEW, THE WANDERING.

**Wanderoo,** or **Wanderu,** in zoölogy, the *Macacus silenus,* from the S. of Hindustan, especially the country bordering the Malabar coast. It is about 2 feet in length, tail 10 to 12 inches. The wanderoos have long, slim bodies, covered with black hair, tail of the same color, tufted. The head looks very large, because of a mane, or ruff, and beard which sticks out round the face.

THE WANDEROO.

This mass of long hair is either gray or white, and adds to the sly look of the broad face, soft dull eyes, and broad muzzle. Also, any species of the genus *Semnopithecus. S. ursinus* is the great wanderoo.

**Wandewash,** a town in the district of South Arcot, Madras presidency, British India; 73 miles S. W. of Madras; famous for the victory gained in December, 1759, by the British under Col. Eyre Coote over the French under Lally and Bussy. It led to the capture of Pondicherry, and was the decisive battle which established the supremacy of the British in the Carnatic, after an almost continuous war of 15 years. In 1781 Wandewash was heroically and successfully defended against Hyder Ali.

**Wang-Chi-Fou** (wäng-chē-fö′), one of the greatest Chinese dramatic poets. He lived in the 13th century, and was the creator of the Chinese opera (called *Thsa-Khi,* lyrical dramas), and is placed by his countrymen among the 10 Thsaï-tseu, or writers of genius. He composed 13 plays, of which only two survive; "Si-siang-ki" (Western Pavilion), like all Chinese plays, a sort of novel in dialogue — his best work — which obtained and still holds great popularity with the Chinese; and the comedy, "The State Minister's Feast." The former was partly translated into French by Stanislas Julien in "Europe Littéraire" (Literary Europe).

**Wangemann, Hermann Theodor** väng′e-män), a German traveler; born in Wilsnack, Brandenburg, Germany, March 27, 1818. He was for several years a director of Lutheran missions. He wrote: "Short History of Evangelical Hymnology" (1855); "A Year's Travel in South Africa" (1869); "Pictures of Life in South Africa" (1871); "South Africa and Its Inhabitants" (1881); "History of the Berlin Missionary Society in South Africa" (1886); "W. Posselt, the Kaffir Missionary" (1888); "The Present Lutheran Church in Its Relation to the Una Sancta" (7 vols. 1883–1884); "The Church Politics of William III." (1884). He died in Brandenburg, June 18, 1894.

**Wangemann, Otto,** a German musician; born in Loitz, Prussia, Jan. 9, 1848; was author of "Sketch of the History of Music" (1882); "History of the Organ" (3d ed. 1891); "History of the Oratorio" (1882); "The Organ and Its Construction" (3d ed. 1895); "Choral Songs for Gymnasiums" (3d ed. 1892).

**Wantley,** a mock heroic ballad, printed in Percy's "Reliques," celebrates a fight in which the dragon of Wantley was worsted and slain. The ballad itself (early 17th century) is a vulgar but justifiable satire on such extravagant fictions, and Percy prints a dubious story of its origin being a lawsuit concerning a claim of tithes made by the Wortley family, whose seat, Warncliff Lodge (locally Wantley), is 6 miles from Rotherham in Yorkshire. If so, the More whose heroism is celebrated may have been attorney or counsellor in the popular cause.

**Wanghee,** or **Whanghee,** a species of tough, flexible cane, imported from the East Indies, said to be the root of the narrow-leaved bamboo, and used for walking sticks. It has a pale, hard bark, and pliable stem, with internodes of about an inch and a half or two inches, and a number of little holes at the knots.

**Wapenshaw,** or **Wapinschaw,** an appearance or review of persons under arms, made formerly in Scotland at certain times in every district. These exhibitions, or meetings, were not designed for military exercises, but only for showing that the lieges were properly provided with arms. The name has been revived in some quarters, and applied to the periodical gatherings of the volunteer corps of a more or less wide district for review, inspection, shooting competitions, and the like.

**Wapentake,** or **Wapentac,** a name formerly given in some of the N. shires of England, and still retained in Yorkshire, to a territorial division of the county corresponding to the hundred of the S. counties. The word means "weapon-touching and refers to the custom of the chiefs of a particular district meeting at a certain day at a specified spot, when the head chief, alighting from his horse, raised his spear in the air, and the inferior chiefs, also on foot, touched this spear with their lances, and so acknowledged their fealty.

**Wapiti,** the name given by the North American Indians to *Cervus canadensis,* a native of North America, ranging from the

THE WAPITI

Carolinas to lat. 56–57° N.. It is closely allied to but considerably larger than the stag, standing about 54 inches at the shoulder; yellowish brown on upper parts; sides gray, long coarse hair in front of neck, like a dewlap; antlers large, brow-tine duplicated. It frequents low grounds, or woody tracts near savannahs or marshes. The venison is of little value, as it is coarse and dry; but the hide makes excellent leather. It is called also, but erroneously, the elk and gray moose.

**Waples, Rufus,** an American lawyer; born in Millsboro, Del., Aug. 11, 1825; was graduated at the Law Department of the University of Louisiana in 1852; began practise in New Orleans in 1853. He was made attorney for the Eastern District of Louisiana in 1863, and served in that capacity for several years; was city attorney in special cases for New Orleans in 1870–1872. Later he settled in Ann Arbor, Mich. His publications include "A Treatise on Proceedings in Rem" (1882); "A Handbook of Parliamentary Practice" (1883); "A Treatise on Attachment and Garnishment" (1885); "A Treatise on Homestead and Chattel Exemption" (1893); "The Law of Debtor and Creditor, Relative to the Situs of Debt" (1898); etc. He died in 1902.

**Wappæus, Johann Eduard** (väp-pā-ös'), a German geographer and statistician; born in Hamburg, Germany, May 17, 1812; became a professor in the university there; edited and largely wrote the Stein-Hörschelmann "Manual of Geography and Statistics" (10 vols. 1871). He also wrote: "Researches on the Geographical Discoveries of the Portuguese Under Henry the Navigator" (1842); "The Republics of South America" (1843); "German Emigration and Colonization" (1846). He died in Göttingen, Dec. 16, 1879.

**Wappatoo,** in botany, the name given by the Indians of Northwestern America to (1) the tubers of *Sagittaria littoralis,* which they eat; (2) to the potato.

**Wapplerite** (after Herr Wappler, of Dresden), a magnesian-pharmacolite crystallizing in the triclinic system; crystals small, sometimes in globular incrustations; hardness, 2–2.5; sp. gr., 2.48; color, white; luster, vitreous. Composition: A hydrated arsenate of lime and magnesia, the mean of two analyses yielding the formula $2CaOAsO_5 + 8H$ where some of the lime is replaced by magnesia. Found at Joachimsthal, Bohemia.

**War,** a contest between nations and States (international war), or between parties in the same State (civil war), carried on by force of arms, and resorted to either for purposes of advantage or of revenge. Formerly, war was waged at the will of despotic monarchs; now wars usually arise, in the first instance, from disputes concerning territorial possessions and frontiers, unjust dealings with the citizens of one State by another, questions of race and sentiment, jealousy of military prestige, or mere lust of conquest. Civil wars arise from the claims of rival competitors for the supreme power in a State, or for the establishment of some important point connected with civil or religious liberty. In all cases, the object of each contending party is to destroy the power of the other by defeating or dispersing his army or navy, by the occupation of some important part of his country, such as the capital, or the principal administrative and commercial centers, or the ruin of his commerce, thus cutting off his sources of recuperation in men, money, and material. An international or public war can only be authorized by the sovereign power of the nations, and previous to the commencement of hostilities it is now usual for the State taking the initiative to issue a declaration of war,

which usually takes the form of an explanatory manifesto addressed to the neutral States. An aggressive or offensive war is one carried into the territory of a hitherto friendly power; and a defensive war is one carried on to resist such aggression. Certain laws, usages, or rights of war are recognized by international law. By such laws it is allowable to seize and destroy the persons or property of armed enemies, to stop up all their channels of traffic or supply, and to appropriate everything in an enemy's country necessary for the support or subsistence of the invading army. On the other hand, though an enemy may lawfully be starved into a surrender, wounding, except in battle, mutilation, and all cruel and wanton devastation, are contrary to the usages of war, as are also the bombarding of a defenseless town, firing on a hospital, the use of poison in any way, or torture to extort information from an enemy.

**War, Civil.** See BATTLE; CIVIL WAR, AMERICAN.

**War, Prisoners of,** in general persons captured from the enemy during military or naval operations. In former times the entire people of a vanquished city, state, or nation became the absolute property of the victors; the men were either put to death or with the women and children became slaves. By later usage the combatants or fighting force are the ones commonly considered and treated as prisoners of war. The young, the sick, the aged; Sisters of Charity, physicians, nurses, and others regularly engaged in attending the sick and wounded; clergymen, representatives of the Red Cross and other recognized humane organizations; musicians with an army; and a variety of other people are considered noncombatants, and are exempted from the treatment accorded to captured combatants. The status of prisoners of war, as far as laws, rules, and customs go, is exceedingly complicated. Where it is desired to weaken an enemy by depriving it of its fighting material, a nation may hold its prisoners of war till after peace is declared. In such a case it will place them in more or less large bodies in or near cities where they can be kept under surveillance. During the time they are held they are entitled to food, medical attendance, and necessary clothing. As long as they do not disturb the quiet of the place or plot mutiny or resistance to their guard, they must be treated without violence or harshness.

A French decree of 1811 says: "Any prisoner of war, having the rank of an officer, and any hostage, who, after having given his parole, violates it, shall, if recaptured, be regarded and treated like a soldier, as to pay and rations, and confined in a citadel, fort, or castle." The theory of modern usage is well stated by Montesquieu, viz.: "To slay an enemy after the battle, or to reduce him to slavery is no longer permitted by international law; to make him lay down his arms, and to hold him as prisoner of war till the reëstablishment of peace (unless a free retreat be granted him, either at once or at a stated time), are what the laws of modern warfare prescribe." A prisoner of war can no longer be forced to serve in the army of the nation which has taken him. It is often the best immediate policy for a nation to speedily relieve itself of its prisoners of war by exchange or freeing them on parole. A prisoner of more than usual importance in a military or a political sense, however, may be held with advantage to the close of the war.

**War, Prize of,** property captured from an enemy, or an enemy's property captured from a neutral in time of war. If the property is captured in naval operations it is known as prize; if in military operations, it is booty. The entire subject of prize and prize money as considered by the United States government is defined in the statute of 1864. In the articles on BLOCKADE, CONTRABAND, and NEUTRALITY (*q. v.*) will be found accounts of what articles constitute prizes and how they may be seized. The statute providing for their disposal is in brief as follows: It is the first duty of the commanding officer of a vessel which has made a capture to send the prize, in charge of a prize master and prize crew, into the nearest convenient port for adjudication. The prize master takes with him all documents found on the vessel. On reaching port the prize master reports to the district attorney of the district in which the port is located, and the attorney files in the United States District Court of the district a libel against the prize property, and a marshal is placed in charge of it. The court appoints a prize commission of three members, who treat the property as an individual under charges and proceed to try it, examining all papers and taking the depositions of the prize master, crew, owners, or representatives of the property, and other witnesses. The report or findings of the commission is submitted to the court, which condemns or releases the property according to the testimony. If the property is condemned the court orders its sale at public auction, and decides how the proceeds shall be distributed.

In case the captured vessel is not in a condition to be sent to a port for adjudication, an appraisement is made, the property is sold, and the proceeds are deposited with the nearest assistant treasurer of the United States pending disposal according

to law. In military operations the booty really belongs to the sovereign or head of the nation whose army has taken it, and consists of personal property. It has been common for the nation to award a portion or even all of the booty to the army that captured it. Possession of the property for 24 hours usually confirms its title to the captor. Public monuments, works of art, libraries, and paraphernalia of religious worship are excluded from property now considered as booty. Movable property belonging to private persons not taking part in hostilities, is not accounted booty by the laws of war, and cannot be taken from the owners. The exception to this rule comprises merchant ships and their cargoes, which may become naval prizes of war.

**War, Rules of,** a code of instructions for the government of armies during hostilities. The instructions for the armies of the United States are contained in "General Orders No. 100," issued April 24, 1863, and reissued in May, 1898. These instructions, originally prepared for the United States armies alone and in the midst of the Civil War, were found to be so comprehensive that they were adopted by both France and Prussia in the war between them, and were the bases on which a general European conference afterward acted in drawing up an agreement on this subject. They cover almost every conceivable feature of military conduct and usage in time of war, and define many technical terms. The instructions embrace 10 sections, viz.:

Section 1.— Martial law, military jurisdiction; military necessity, retaliation. Section 2.— Public and private property of the enemy, protection of persons, and especially of women; of religion, the arts and sciences, punishment of crimes against the inhabitants of hostile countries. Section 3.— Deserters, prisoners of war, hostages, booty on the battlefield. Section 4.— Partisans, armed enemies not belonging to the hostile army, scouts, armed prowlers, war rebels. Section 5.— Safe conduct spies, war traitors, captured messengers, abuse of the flag of truce. Section 6.— Exchange of prisoners, flags of truce, flags of protection. Section 7.— The parole. Section 8.— Armistice, capitulation. Section 9.— Assassination. Section 10.— Insurrection, civil war, rebellion.

The following is a summary of the most important instructions: Military necessity admits of all direct destruction of life or limb of "armed" enemies and of other persons whose destruction is incidentally "unavoidable" in the armed contests of the war. Military necessity does not admit of cruelty — that is, the infliction of suffering for the sake of suffering or for revenge, or of maiming or wounding, except in fight, nor

War

of torture to extort confessions. It admits of deception, but disclaims acts of perfidy. It is lawful to starve the hostile belligerents, armed or unarmed, so that it leads to the speedier subjection of the enemy. When a commander of a besieged place expels the noncombatants, in order to lessen the number of those who consume his stock of provisions, it is lawful, though an extreme measure, to drive them back, so as to hasten on the surrender. Commanders, whenever admissible, inform the enemy of their intention to bombard a place, but it is no infraction of the common law of war to omit thus to inform them. Surprise may be a necessity.

Retaliation will never be resorted to as a measure of mere revenge, but only as a means of protective retribution, and, moreover, cautiously and unavoidably — that is to say, retaliation shall only be resorted to after careful inquiry into the real occurrence and the character of the misdeeds that may demand retribution. The more vigorously war is pursued, the better it is for humanity. Sharp wars are brief. A victorious army appropriates all public money, seizes all public movable property till further directed by its government, and sequesters for its own benefit or that of its government all the revenues of real property belonging to the hostile government or nation. The title to such real property remains in abeyance during military occupation, and till the conquest is made complete. The United States acknowledges and protects, in hostile countries occupied by them, religion and morality, strictly private property, the persons of the inhabitants, especially those of women, and the sacredness of domestic relations.

Deserters from the American army, having entered the service of the enemy, suffer death if they fall into the hands of the United States. It is against the usage of modern war to resolve in hatred and revenge to give no quarter. Outposts, sentinels, or pickets are not to be fired on except to drive them in, or when a positive order, special or general, has been issued to that effect. Whoever intentionally inflicts additional wounds on an enemy already wholly disabled, or kills him, or orders that this shall be done, shall suffer death if convicted. Martial law is explained as simply military authority exercised in accordance with the laws and usages of war. A place, district, or country occupied by an enemy stands, in consequence of the occupation, under the martial law of the invading or occupying army. It extends to property and to persons, whether they are subjects of the enemy or aliens to that government. Whenever feasible, martial law is carried out in cases of individual offenders by military courts, but sentence of death shall be ex-

ecuted only with the approval of the chief executive, provided the urgency of the case does not require a speedier execution, and then only with the approval of the chief commander. Martial law should be less stringent in places in countries fully occupied and fairly conquered.

**Warbeck,** or **Osbec, Perkin,** a pretender to the English crown; was the son of a Flemish Jew, and was set up by Margaret of York, Dowager-Duchess of Burgundy, as claimant of the crown of England against Henry VII. For this purpose she recognized him as her nephew, Richard Plantagenet, Duke of York, the younger of the two princes who were murdered in the Tower by Richard III. He was patronized by France and Scotland, married a kinswoman of the Scotch king, James IV., made several fruitless invasions of England and Ireland, was taken prisoner after an attempt on Cornwall (October, 1497), and confined to the Tower, where, his plotting being continued, he was executed, Nov. 23, 1499.

**Warbler,** a popular name often applied to all the birds of the family *Sylviidæ;* (sometimes called by the French name of fauvettes); many of which, however, commonly receive other popular names, as the blackcap, nightingale, hedgesparrow, redbreast, redstart, stonechat, wheatear, white-

REED WARBLER.

throat, etc., while many receive the name warbler with some adjunct — reed warbler, etc. The more typical genera comprise birds of small size and plain plumage, usually alike in both sexes; most of them are migratory, going a long way S. of their breeding haunts to winter; for instance, the Siberian chiff chaff (*Phylloscopus tristis*) winters in India. Such genera are *Sylvia*, to which the blackcap and garden warbler belong; *Locustella* of which is the grasshopper warbler (*L. nævia*), not infrequent in many parts of England, and found also in the S. of Scotland and in Ireland. It is found in most parts of the center and S. of Europe, at least during summer, being a bird of passage. It is of a greenish-brown color, the centers of the feathers dark brown, producing a spotted appearance; the lower parts pale brown. It is a shy bird, hiding itself in hedges and bushes, but very active, often darting out like a mouse from the bottom of the hedge, and receives its name from its chirping, grasshopper-like note.

The genus *Acrocephalus* has, like the foregoing, a rounded tail; the species frequent watery places, and are known as reed warblers. Some of them nearly equal a thrush in size. The sedge warbler (*A. schœnobœnus*) is the most common British species, and is generally found in thick patches of reeds or willows in marshes, or in other situations close to water, and where the aquatic herbage is thick and strong. It abounds on the marshy banks of the Thames. The reed warbler (*A. streperus*) is found in summer in marshy situations in the S. of England; it abounds in Holland and in many parts of Europe, and its range extends to the N. of India. It is of a uniform pale brown, with a tinge of chestnut; the chin and throat white; the under parts pale buff color. Its nest is remarkable; it is attached to the stems of three or four reeds, and formed by winding grass or the branches of reed panicles together with a little wool, and is conical and deep, so that the eggs or young may not be thrown out when the reeds are shaken by the wind.

The *Phylloscopi* feed chiefly on small insects and larvæ which infest the foliage of trees; they are small species, and in color vary above from olive-green to brown, and below from yellow or greenish yellow to white. They build semi-domed nests. The chiff chaff (*P. collybita*), so named from its two-noted cry, is a familiar early migrant to Great Britain. The wood warbler, also known as the wood wren (*P. sibilatrix*), is common in the wooded districts of England in summer, particularly in old plantations of oak and beech. The willow warbler (*P. trochilus*) is very com-

REED WARBLER'S NEST.

mon in the S. of England in summer, but more rare in N. parts of Great Britain. It frequents woods, shrubberies, thick hedgerows, and bushes, but builds its nest on the ground. Numerous species of warblers are found in North America, but these belong to a quite distinct family (*Miniotiltidæ*) which appears to graduate into the tanagers. They are birds of brighter plumage than the Old World warblers, but resemble them in their habits, and are also migrants. Not a few of the species are therefore reckoned among the birds of the West Indies, just as some of the European species are found in Africa. Asia has many species of warblers, among which some of the European species are included. Australia has many species of warblers, some of which (*Malurus*) are of very beautiful plumage, but these are sometimes made a distinct family (*Maluridæ*).

**Warbles,** a disease of horses, by which name, and also grubs and sitfast are designated the presence of hard lumps, proceeding originally from the swelling of the glands at the root of the hair, occurring generally at the neck, withers, and back and at the roots of the mane and tail, generally appearing in the spring. They are inflamed follicles, which break and suppurate, and often end in small ulcers difficult to heal, where they are irritated by the harness or otherwise. They sometimes assume a malignant character which may end in mortification, or an inflamed ring around a whitish central path. It is then termed sitfast and is difficult to heal. In the more simple forms of the disease, when the pimples are ulcerating, they should be poulticed to promote suppuration, but with this in any case to alter the secretions the animal's bowels should be prevented from becoming costive, and an ounce of sulphur should be given in the feed once a day. If the sores seem to need a greater stimulation than poulticing will give, the following resolvent may be used as an ointment: One part of biniodide of mercury and seven parts of neatsfoot oil. Rub well together and apply every day with gentle friction till the skin is excited or somewhat inflamed. If the difficulty ends in sitfast, cut out the hard part or dead skin in the center, and cover the whole with crude petroleum, or, better, dress with an ointment of one drachm of carbolic acid and three ounces of lard.

**Warburton, Eliot Bartholomew George,** an Irish barrister and author; born in Aughrim, County Galway, Ireland, in 1810. He traveled in the East, and wrote: "The Crescent and the Cross; or, Romance and Reality of Eastern Travel" (2 vols. 1844); "Memoirs of Prince Rupert and the Cavaliers" (3 vols. 1849); "Reginald Hastings" (3 vols. 1850), a novel of the Great Rebellion; "Memoirs of Horace Walpole and His Contemporaries" (2 vols. 1851); "Darien; or, The Merchant Prince; An Historical Romance" (3 vols. 1851); and "A Memoir of Charles Mordaunt, Earl of Peterborough" (3 vols. 1853). He was lost on his way to Darien in the burning of the steamer "Amazon," off Land's End, Jan. 4, 1852.

**Warburton, Peter Egerton,** an Australian explorer; born in Norwich, England, Aug. 15, 1813. He wrote: "Major Warburton's Diary" (1866); "Journey Across the Western Interior of Australia" (1875). He died near Adelaide, Nov. 5, 1889.

**Warburton, William,** an English prelate; born in Newmarket-upon-Trent, England, Dec. 24, 1698. He was brought up to the law, but not finding this profession to his taste, he relinquished it, and in 1723 took deacon's orders in the Church. In 1727 he began to distinguish himself as a writer by his inquiry into the "Causes of Prodigies and Miracles." This led to his being presented to the rectory of Brand Broughton, in Lincolnshire, where he remained many years, composing here most of those works which contributed to the establishment of his fame. In 1736 appeared his first important work, the "Alliance Between Church and State," etc., which brought him into favorable notice at court; but his great work is the "Divine Legation of Moses." It was assailed in many quarters, and Warburton carried on the controversy with ability and intemperate vigor. A defense of Pope's "Essay on Man" secured him the friendship of the poet, and he became a considerable beneficiary under the latter's will. By the death of Ralph Allen, whose niece he had married in 1745, Warburton succeeded to the splendid seat of Prior Park, in Gloucestershire. He was appointed, in 1746, preacher to the Society of Lincoln's Inn, and from that time his advance in Church preferment was rapid, till he became Bishop of Gloucester in 1759. He died in Gloucester, June 7, 1779.

**Ward, Adolphus William,** an English educator, literary historian, and biographer; born in Hampstead, London, Dec. 2, 1837; was educated at Cambridge. He was Professor of History and English Literature at Owens College, Manchester (1866); principal (1870–1897); Vice-Chancellor of Victoria University (1886–1890, and 1894–1896); and Ford Lecturer at Oxford (1898). He contributed to the "Encyclopædia Britannica" and leading English reviews, and wrote: "The House of Austria in the Thirty Years' War" (1869); "Dramatic Literature of the Age of Elizabeth" (2 vols. 1875); "Lives" of Chaucer (1879) and Dickens (1882) in the "English Men

of Letters" series; "Great Britain and Hanover" (Ford Lectures, 1899); translator of Curtius's "History of Greece" (5 vols. 1868–1874); and editor of "Pope's Poem's" (Globe edition, 1869), and of "Byron's Poems" (Chetham Society's edition).

**Ward, Artemas,** an American military officer; born in Shrewsbury, Mass., in 1727; was graduated at Harvard College in 1748; entered public life at an early age as a representative to the General Assembly; and afterward became a member of the Executive Council. He served with distinction in the Revolutionary War, and was in command of the besieging forces at Boston till the arrival of General Washington, after which he was stationed with the right wing on Roxbury Heights. In consequence of impaired health he resigned his commission of Major-General, in April, 1776, but at the request of Washington continued to serve till the end of May. He was elected chief-justice of the Court of Common Pleas of Worcester county in 1776; was president of the Massachusetts Executive Council in 1777, and a member of the Legislature for 16 years; and served in Congress in 1791–1795. He died in Shrewsbury, Mass., Oct. 28, 1800.

**Ward, Artemus.** See Browne, Charles Farrar.

**Ward, Edward Matthew,** an English painter; born in London, England, in 1816. In 1835 he joined the classes at the Royal Academy. The following year he went to Italy, where he studied fresco painting under Cornelius. He took part in the competition, opened in 1843, for decorating the Houses of Parliament, his designs being illustrative of events in the history of Boadicea. Eight of his designs were finally accepted, and executed by him in the corridor of the House of Commons in 1853. He was elected A. R. A. in 1847, and R. A. in 1855. For his subjects he generally chose interesting historical episodes and popular characters; hence many of his paintings have been largely reproduced by the engraver. "Dr. Johnson in Lord Chesterfield's Anteroom," and the "Royal Family of France in the Temple," are considered among his best works. He died in Windsor, Jan. 15, 1879.

**Ward, Elizabeth Stuart Phelps,** an American novelist and poet; born in Andover, Mass., Aug. 31, 1844. In 1888 she married Herbert D. Ward, with whom she sometimes collaborated. Among her books are: "The Gates Ajar" (1868), one of the most successful of American stories; "Men, Women, and Ghosts" (1869); "The Silent Partner" (1870); "The Trotty Book" (1870); "The Story of Avis" (1877); "Old Maid's Paradise" (1879); "Beyond the Gates" (1883); "Dr. Zay" (1884); "The Gates Between" (1887); "The Master of the Magicians" (1890); and "Come Forth" (1890). Jointly with her husband she wrote: "Poetic Studies," verse (1885); "Songs of the Select World" (1885); and "The Struggle for Immortality" (1889), a volume of essays. She died Jan. 28, 1911.



**Ward, Henry Augustus,** an American naturalist; born in Rochester, N. Y., March 9, 1834; became assistant to Prof. Louis Agassiz at the Howard Scientific School in 1854; studied in Paris and traveled through Europe and the Orient in 1855–1859; was Professor of Natural Sciences in Rochester University in 1860–1865; and manager of gold mines in Montana and South Carolina in 1866–1869. In 1870 he began to travel in various countries, making large and valuable cabinets of mineralogy and geology, which he distributed among the universities and colleges of the United States. He founded, at Rochester, N. Y., an establishment where these cabinets were prepared, taxidermy executed, and natural-science collections arranged; was acting naturalist on the United States expedition to Santo Domingo; and wrote "Notices of the Megatherium Cuvieri," and "Description of the Most Celebrated Fossil Animals in the Royal Museums of Europe." He died July 4, 1906.

**Ward, Herbert Dickinson,** an American writer of juvenile books; born in Waltham, Mass., June 30, 1861; was graduted at Amherst College; Massachusetts State Commissioner of Prisons; wrote "The Captain of the Kittiwink"; "A Dash to the Pole"; "The New Senior at Andover"; "The White Crown," etc.; "The Burglar who Moved Paradise"; "The Lost Hero"; "The Light of the World" (1901).

**Ward, Mrs. Humphry** (Mary Augusta Arnold), an English novelist; born in Hobart Town, Tasmania, June 11, 1851; eldest daughter of Thomas Arnold, second son of the great Dr. Arnold of Rugby. In 1872 she married Thomas Humphry Ward (born in 1845), the editor of "The English Poets" (4 vols. 1880–1881), "Men of the Reign" (1885), "Men of the Time" (12th ed. 1887,) and "The Reign of Queen Victoria" (1887). She began early to contribute to "Mac-

MRS. HUMPHRY WARD.

millan's Magazine," and gave the fruits of her Spanish studies to Smith and Wace's "Dictionary of Christian Biography. A child's story, "Milly and Olly" (1881), "Miss Bretherton" (1884), a slight but promising novel, and the translation of Amiel's "Private Journal" (1885) prepared the way for the widely read spiritual romance of "Robert Elsmere" (1888). The book was an attempt to represent the struggle of a soul in its voyage toward newer theistic aspirations after losing the landmarks of the old faith. Profound spiritual insight, broad human sympathy, and strong thinking are manifest throughout, but as a work of art it is marred by diffuseness, its didactic persistency of purpose, and a fatal want of mastery over the fundamental secret of the novelist — the power to make his puppets live rather than preach. Its phenomenal success was due to the fact that it was a genuine product of an age of spiritual unrest, when men were everywhere looking for a sign. Its successor, "David Grieve" (1892), showed all its faults but hardly all its merits, and yet is said to have brought its author in the first two months no less than $90,000. "Marcella" appeared in 1894; a short story, "Bessie Costrell," in 1895; "Sir George Tressady," a sequel to "Marcella," in 1896; and "Helbeck of Bennisdale," in 1898.

**Ward, James,** a British painter; born in London, England, in 1769. He early became eminent as an engraver, and only took to painting when arrived at middle age. His exquisite delineations of animals speedily secured him fame, and he was extensively patronized by George III. He died in Cheshunt, in 1859.

**Ward, John Quincy Adams,** an American sculptor; born in Urbana, O., June 29, 1830. In 1850 he entered the studio of Henry K. Browne, where he remained six years. In 1861 he opened a studio in New York, where he modelled his "Indian Hunter," "The Good Samaritan," Commodore M. C. Perry, with reliefs, "The Freedman," and many busts and small works. In 1869 he built a studio in Forty-ninth Street, New York, where he made the "Citizen Soldier," and statues of Shakespeare, General Reynolds, General Washington, General Israel Putnam, an equestrian statue of General Thomas, General Daniel Morgan and Lafayette. He built a larger studio in 1882, where he made the colossal statue of Washington for the New York subtreasury building, a colossal statue of President Garfield, "The Pilgrim," etc. He designed the crowning group of "Victory" in the arch for the Dewey reception in New York in 1899. For three years he was vice-president, and for one term president of the National Academy of Design. Died May 1, 1910.

**Ward, Nathaniel,** an English-American lawyer, clergyman, and author; born in Haverhill, England, about 1578. He emigrated to Massachusetts in 1634; lived in Ipswich (Agawam); returned to England in 1647. While a pastor in Massachusetts he wrote the "Body of Liberties," adopted December, 1641, the first code of laws established in New England. His other writings are: "The Simple Cobler of Agawam" (1647); "A Religious Retreat Sounded to a Religious Army" (1647); "A Sermon Before Parliament" (1647); and "Mecurius Anti-Mechanicus; or, The Simple Cobler's Boy, with his Lap-full of Caveats" (1648). He died in Shenfield, Essex, about October, 1653.

**Ward, Robert Plumer,** an English writer; born in London in 1765. His novels, "Tremaine" (1825), and "De Vere" (1827), published anonymously, were exceedingly popular. His other works include treatises on the law of nations and essays on jurist topics. He died in 1846.

**Ward, William G.,** an American educator; born in Sandusky, O., Nov. 5, 1848; was graduated at Ohio Wesleyan University in 1872, and studied theology at Drew Theological Seminary; afterward followed special studies at the Universities of Halle and Berlin; was president of Spokane College in 1890–1892, and Professor of English Literature at Syracuse University in 1893–1898. In the latter year he became Professor of English Literature at the Emerson College of Oratory, Boston, Mass. He was the author of "Tennyson's Debt to Environment" (1898); "The Poetry of Robert Browning" (1898); "Art for Schools" (1899); and "Studies in Literature" (1901).

**Ward, William Hayes,** an American editor, clergyman, and Assyriologist; born in Abington, Mass., June 25, 1835; was graduated at Amherst (1856); and at Andover Theological Seminary (1859). He was a pastor of the Congregational Church and professor at Ripon College in 1860–1868; became editor of the "Independent" in 1870. In 1884 he went to Babylon in charge of an exploring expedition. He wrote much on Oriental archæology for the "Bibliotheca Sacra," and other journals, and prepared the report of the expedition of 1884, and published "Biography of Sidney Lanier" (1885), "Notes on Oriental Antiquities."

**War Dance,** a dance engaged in by savages, before a warlike expedition; a dance simulating a battle.

**Warden, David Adams,** an American musician; born in London, England, in 1815; settled in the United States prior to the Civil War; was organist in several

Protestant Episcopal churches in his earlier years. During the Civil War he composed the music of many patriotic songs, which were sung by both armies. The best known of these include "The Flags Come Back to Tennessee," and "All Quiet Along the Potomac Tonight." He also wrote both the words and music of "Mother, Don't Weep for Your Boy," and "Tell Me, Ye Winged Winds," and was the author of a book of chants. He died in Philadelphia, Pa., Feb. 4, 1902.

**Warden, David Baillie,** an Irish-American scholar; born in 1788. He was graduated at the New York Medical College, was United States secretary of legation at Paris, and subsequently consul from 1804 to his death. He was a member of the French Institute, and published: "Inquiry concerning the Intellectual and Moral Faculties and Literature of the Negroes" (1810); "Origin and Nature of Consular Establishments" (1816); "Description of the District of Columbia" (1816); "Statistical, Political, and Historical Account of the United States" (1819); "L'Art de vérifier les dates: Chronologie Historique de l'Amerique" (Art of Verifying Dates: Historical Chronology of America 10 vols. Paris, 1826–1844); "Bibliotheca Americana Septentrionalis" (North American Library), etc. (1820); "Recherches sur les Antiquities de l'Amerique Septentrionale" (Researches in North American Antiquities, 1827); and "Bibliotheca Americana" (1831). He died in Paris, Oct. 9, 1845.

**Warden, Florence,** pen name of Mrs. George E. James, an English novelist; born (Florence Alice Price) in Hamworth, Middlesex, England, May 16, 1857; was on the stage in 1880–1885. She won note with "The House on the Marsh" (1882), which had a wide sale. She afterward published: "At the World's Mercy"; "A Vagrant Wife"; "A Prince of Darkness"; "A Dog With a Bad Name"; "Doris's Fortune"; "Scheherazade: A London Night's Entertainment"; "Pretty Miss Smith"; "Lady in Black"; "A Very Rough Diamond" (1899); "The Guinea Pigs," a play; etc.

**Warden, Lord.** Before the union of England and Scotland the duty of protecting the border counties of the former country from hostile raids was assigned to certain officers called lord wardens of the marches. The lord warden of the Cinque Ports is a dignitary dating from the days of William the Conqueror. He has a peculiar maritime jurisdiction and the nominal guardianship of the S. E. coast of England, but the office is almost a sinecure. It gives right to the use of Walmer Castle as a residence. There is also a lord warden of the stannaries.

**War Department,** one of the executive departments of the United States government; is under the supervision of a Secretary of War, who has entire control of all matters relating to the equipment, discipline, etc., of the military forces of the country, and is charged with the duty of carrying into effect all laws relative to the army enacted by Congress. His authority in military matters is second only to that of the President of the United States. He is a Cabinet officer, and is usually accounted the third in point of dignity and importance, the portfolios of State and the Treasury being the first two. During the stormy career of the republic this office has several times been one on which devolved the conduct of weighty affairs. The first Secretary of War was Henry Knox of Massachusetts, whose term of office began with that of President Washington. During the second war with Great Britain three secretaries of war followed each other in quick succession. They were John Armstrong, James Monroe, and William H. Crawford. The secretary at the time that war broke out was William Eustis. During the Mexican War William L. Marcy guided the department. During Buchanan's administration, the exciting period just preceding the Civil War, John B. Floyd was the head of the department, and it was charged that his Southern sympathies induced him to store a large amount of war supplies in the South, which supplies when appropriated by the seceding States enabled them to levy war against the general government. He was succeeded by Joseph Holt, who, on the breaking out of hostilities, severed his connection with the department, and was succeeded by Simon Cameron, who in the same year (1861) gave place to Edwin M. Stanton, under whose guidance the department waged the long and bloody war of secession. Stanton during the reconstruction period was succeeded ad interim by Gen. U. S. Grant, and the following secretaries succeeded in the order named: Lorenzo Thomas, John M. Schofield, John A. Rawlins, William T. Sherman, and W. W. Belknap, whose term of office expired when the country was once more in *statu quo*. See United States: Secretaries of War.

**Wardholding,** the military tenure of land in Scotland under the feudal system, under which the vassal was obliged to serve the superior in war, when called on to do so. The tenure, being considered unsuited to the times, was abolished in the reign of George II.; tenures from the crown being changed into blanch, those of subjects into feu.

**Wardian Cases,** boxes covered with tight-fitting frames of glass, under which plants are successfully raised that could not

be grown in the vitiated atmosphere of some cities or dwellings. They are named after N. B. Ward, a surgeon of London, who first announced his discovery to Sir William Hooker in 1836. Plants have been successfully transported long distances packed in these cases. By means of them Mr. Fortune conveyed 20,000 tea plants from Shanghai to the Himalaya, and they have enabled the transport to be effected of the cinchona tree from South America to India.

**Wardlaw, Elizabeth, Lady,** a Scotch poet; born in 1677; the second daughter of Sir Charles Halkett, of Pitfirrane. She married in 1696 Sir Henry Wardlaw, of Pitreavie, also near Dunfermline. Her pseudo-archaic ballad, "Hardyknute, a Fragment," was first published in 1719 as a genuine antique, and, expanded from 216 to 336 lines, had been two or three times reprinted, when Percy in the second edition of his "Reliques" revealed the secret of its authorship. To Lady Wardlaw also Dr. Robert Chambers in 1859 ascribed "Sir Patrick Spens," "The Douglas Tragedy," and many more of the finest traditional Scotch ballads. Endorsed through it be by Professor Masson in his "Edinburgh Sketches" (1892), the theory is untenable; still our debt to Lady Wardlaw is a heavy one, for "Hardyknute," says Scott, was "the first poem I ever learnt, the last I shall ever forget." She died in 1727.

**Wardlaw, Ralph,** a Scotch Congregationalist; born in Dalkeith, Dec. 22, 1779. He studied at the University of Glasgow, and at the Selkirk "Hall" of the Burgher Synod; but, becoming dissatisfied with the tenets of that body and of Presbyterianism in general, he embraced the doctrines of the Independents. He held office in that body, first at Perth, then at Dumfries, and finally (1803) at Glasgow. He also (1811) became principal Professor of Theology at the "Hall" of his denomination in that town. In 1818 Wardlaw received the degree of D. D. from Yale College. He wrote a large number of works, chiefly of a polemical character; the chief were: "Discourses on the Socinian Controversy" (1814), "Unitarianism Incapable of Vindication" (1816), "Dissertation on the Scriptural Authority, Nature and Uses of Infant Baptism" (1825), "Discourses on the Sabbath" (1832), "Christian Ethics" (2d. ed. 1839), and "National Church Establishments Examined" (1839). Besides these he published a number of sermons, a discourse on miracles and a number of writings in support of the peculiar doctrines of his own sect. Wardlaw was a man of very orthodox opinions. These he defended with zeal and ability, and at the same time fairly and moderately. He died Dec. 17, 1853.

**Wardrobe,** a room or apartment where clothing or wearing apparel is kept; or, more generally, a portable closet or piece of furniture for hanging up wearing apparel. Hence, wearing apparel in general; articles of dress and decoration; as, a sumptuous wardrobe.

**Wardship,** in English feudal law, the guardianship which the feudal lord had of the land of his vassal while the latter was an infant or minor. Till the majority of the infant the lord, out of the profits, provided a fit person to render the services incumbent on the vassal. In the case of a female ward, he could dispose of her hand in marriage.

**Ward's Island,** an island in the East river, opposite New York city; forming the N. boundary of Hell Gate. It is nearly circular and comprises about 200 acres. It is in the corporate limits of New York city, and contains a large Insane Asylum for Males, a Home for Invalid Soldiers, a Home for Children, a Lunatic Asylum, and the State Emigrant Hospital.

**Ware, Henry, Jr.,** an American clergyman and religious writer; born in Hingham, Mass., April 21, 1794. He took an active part in the organization of the Unitarian movement. Among his writings are: "Hints on Extemporaneous Preaching" (1824); "Recollections of Jotham Anderson" (about 1824); "On the Formation of the Christian Character" (1831); "Life of the Saviour" (1832; new. ed. 1868); "The Feast of the Tabernacle," an oratorio poem (1837); "Memoirs" of Rev. Dr. Parker (1834), Dr. Noah Webster, Dr. John Priestley, and Oberlin; and "Scenes and Characters Illustrating Christian Truth" (2 vols. 1837). Selections from his writings were published in four volumes 1846–1847. He died in Framingham, Mass., Sept. 22, 1843.

**Ware, William,** an American clergyman, editor, and author; born in Hingham, Mass., Aug. 3, 1797. In addition to his pastorates, and his editorship of the "Christian Examiner," he wrote the following: "Letters from Palmyra" (1837), first published in the "Knickerbocker Magazine," subsequently republished as "Zenobia; or, The Fall of Palmyra" (new ed. (1868); "Probos; or, Rome in the Third Century" (1838), republished as "Aurelian" (new ed. 1868); "Julian; or, Scenes in Judea" (1841); "Sketches of European Capitals" (1851); "Lectures on the Works and Genius of Washington Alston" (1852); and a "Life of Nathaniel Bacon," in Sparks's series. He edited "American Unitarian Biography" (1850). He died in Cambridge, Mass., Feb. 19, 1852.

**Warehousing System,** a customs regulation, by which imported goods may be lodged in public or bonded warehouses, at a reasonable rent, without payment of the duties on importation, till they be withdrawn for home consumption, thus lessening the pressure of the duties, which would otherwise cripple the purchasing power of the merchant. In the United States the warehousing system has been extended to other than imported goods. Thus spirituous liquors may be deposited by the manufacturer in government warehouses and payment of the internal revenue duty delayed till the liquors are withdrawn. Liquors so held are said to be in bond.

**Warfield, Benjamin Breckinridge,** an American educator; born in Lexington, Ky., Nov. 5, 1851; was graduated at Princeton University in 1871; studied at the Princeton Theological Seminary and at the University of Leipsic; became Professor of New Testament Language and Literature in the Western Theological Seminary in 1878, and continued there till 1887, when he was called to the chair of didactic and polemical theology at Princeton Seminary. He was also editor of the "Presbyterian and Reformed Review," and the author of "The Divine Origin of the Bible"; "Augustine's Anti-Pelagian Treatise"; "The Right of Systematic Theology"; "On the Revision of the Confession of Faith"; etc.

**Warfield, Catharine Ann (Ware),** an American poet and novelist; born near Natchez, Miss., June 6, 1816. She published with her sister Eleanor, "The Wife of Leon, and Other Poems" (1844); "The Indian Chamber," etc. (1846); and wrote "The Household of Bouverie" (1860); "The Romance of the Green Seal" (1867); "Miriam Monfort" (1873); "Hester Howard's Temptation" (1875); "A Double Wedding" (1875); "Sea and Shore" (1876); "The Romance of Beauseincourt" (1876); "Ferne Fleming" (1877); "The Cardinal's Daughter" (1877). She died in Kentucky, May 21, 1877.

**Warfield, Ethelbert Dudley,** an American educator; born in Lexington, Ky., March 16, 1861; was graduated at Princeton University in 1882 and at the Columbia College Law School in 1885; practised law in Lexington, Ky., in 1886–1888; was Professor of History in Miami University in 1888–1891; became president and Professor of History in Lafayette College in 1891; and was ordained in the Presbyterian Church in 1899. His publications include "The Kentucky Resolutions of 1798; an Historical Study"; "At the Evening Hour"; and "Memoir of Joseph Cabell Breckinridge, U. S. N."

**War God,** in anthropology, the personified spirit of tribal war; a deity supposed to watch over tribal or national interests in times of war. In some cases the war god seems to have been the chief deity; in classic times the war gods (Ares and Mars) were among the superior gods; the Jews seem to have conceived that the function of a war god was a fitting attribute of Jehovah (II Sam. xvii: 45); and traces of this mode of thought linger in the familiar expression, The God of battles.

**War Indemnity,** the sum of money paid by the defeated country in an international war to the victorious government. The largest amount ever demanded in this way was $1,000,000,000, which France was compelled to pay to Germany after the war of 1870–1871. The war lasted 28 weeks; the number of German troops was estimated in round numbers at 1,000,000; of these they lost 128,000. Germany therefore received in cash $35 a week for each man's services, or $8,000 for each man lost.

In the war of 1866 Prussia took from Austria and her allies a war indemnity of $41,750,000, besides $3,750,000 requisition during the campaign. Prussia had 437,000 men in the field and lost 11,000; the war lasted one month; she received, therefore, $25 a week for each man's services, or $4,200 for each man lost. The war between Japan and China covered about nine months and the amount paid by the latter nation was $185,000,000. The Japanese had 80,000 troops, which made the indemnity equivalent to $60 a week for each soldier. But for the intervention of Russia the sum paid by China would have been much larger.

For the Turko-Russian war of 1877, Russia demanded $701,000,000, but her claim was reduced to $160,000,000, which amounted to $6.25 for each soldier. Great Britain has received two indemnities from China, the first, in 1840, being $25,000,000 and the second in 1860 about $10,000,000. The claim of Canada for indemnity for the Fenian raid from the United States in 1866 was settled by England, which country was anxious to maintain friendly relations with the United States government. In every instance where an indemnity has been exacted, save in the case of the Turko-Russian war of 1877, a portion of the vanquished power's territory has remained in military occupation by the victor, at the expense of the defeated nation, till the money has been paid. No indemnity beyond the cession of territory was exacted of Denmark by Austria and Prussia at the close of the war of 1864, and the same thing may be said of Austria at the time of her defeat by France and Italy in 1859. The Sultan of Turkey was forced by the powers to reduce his claims of $50,000,000 on Greece at the close of the war of 1897 to $10,000,000.

The settlement of war claims between the United States and Spain at the end of the

war of 1898 was unique. The American-Spanish war lasted four months; it cost the United States $150,000,000, in money and 1,941 men. The Spaniards were defeated in every battle on sea and land, and finally sued for peace. A treaty prepared by a joint commission of American and Spanish representatives, was signed by President McKinley Feb. 10, and by the Queen Regent of Spain March 17, 1899. By the terms of this treaty the United States relinquished all claims for indemnity of any kind, and agreed to send back to Spain, at its own cost, all Spanish soldiers taken prisoners, with their arms. All the stands of colors, uncaptured ships, small arms and guns of every kind, with their accessories, together with materials and supplies of all kinds belonging to the land and naval forces of Spain in the islands of the Philippines and Guam were to remain the property of Spain. The pieces of heavy ordnance, exclusive of field artillery, in the fortifications and coast defenses were to remain in their places for six months, the United States being permitted to purchase them from Spain during that time if satisfactory terms could be agreed on. The United States further agreed to pay to Spain the sum of $20,000,000. On her part, Spain was to relinquish all claim of sovereignty over Cuba; to cede to the United States the island of Porto Rico, and other islands then under Spanish sovereignty in the West Indies; the island of Guam, in the Ladrones; and the archipelago known as the Philippine Islands. In this case it would appear that the victors paid for their success and the conquered profited by their defeat, reversing the old proverb, "To the victors belong the spoils."

At the close of the trouble between China and the powers, growing out of the Boxer uprising in 1900, it was agreed that China pay the powers 450,000,000 taels as an indemnity. See CHINA.

**Waring, George Edwin,** an American sanitary engineer; born in Poundridge, N. Y., July 4, 1833; received a public school education; studied agriculture and agricultural chemistry; and became drainage and agricultural engineer of Central Park, New York city, in 1857. When the Civil War broke out he was commissioned major of the 39th New York Volunteers. After serving three months in the Army of the Potomac he was transferred to the Department of the Southwest. He recruited six troops of cavalry, which, with the Benton Hussars, were organized into the 4th Missouri Cavalry, of which he was commissioned colonel. In 1877 he turned his attention to sanitary engineering. After the yellow-fever epidemic of 1878 in Memphis, Tenn., he planned and executed a sewerage system in that city which attracted the attention of sanitarians everywhere, and which has been adopted since in many large cities. In 1882 he was appointed a member of the National Board of Health, and remained on it several years. He was commissioner of street cleaning in New York city from Jan. 15, 1895, to Jan. 1, 1898; introduced the white canvas uniforms for street cleaners; and won wide commendation by his effective work. In October, 1898, he was sent to Havana by the United States government to arrange a plan for the sanitary improvement of that city, and while there contracted yellow fever from which he died in New York, Oct. 29, 1898. His publications include "The Elements of Agriculture" (1854); "Whip and Spur" (1875); "Sanitary Drainage of Houses and Towns" (1876); "Sanitary Condition of City and Country Dwelling Houses" (1877); "Modern Methods of Sewage Disposal for Towns" (1894); etc.

**Waringtonite,** or **Warringtonite** (after Warington Smyth), a variety of brochantite, of pale green color, occurring in doubly curved, wedge-shaped crystals at the Fowey Consols Mine, Cornwall.

**Warkamoowee** (-mö'-), a canoe with outriggers, used at Point de Galle, Ceylon. It is generally manned by four or five Lascars, who sit grouped together for hours at the end of the lever, adding or taking away a man according to the strength of the wind. These canoes often sail 10 miles an hour, and their navigators will venture, even through very high winds, as far as 20 to 25 miles from land for the purpose of fishing, or to carry fruit to vessels in the offing.

**Warman, Cy,** an American author; born in Greenup, Ill., June 22, 1855; received a common school education; settled in Colorado in 1880 and was employed in the Denver and Rio Grande railroad shops. In 1888 he engaged in journalism; became editor of the "Western Railway," and in 1892 of the "Creede Chronicle." He traveled in Europe and became known as "the Poet of the Rockies." His publications include "Sweet Marie" (a popular song); "Tales of an Engineer" (1895); "The Express Messenger" (1897); "Frontier Stories" (1898); "The Story of the Railroad" (1898); "The White Mail" (1899); "Snow on the Headlight" (1899); "Short Rails"; "A Volume of Verse"; etc.

**Warm=blooded Animals,** the name given to mammalia and aves or birds, in contradistinction to fishes, amphibians, and reptilia, as lower vertebrata, and to all invertebrate animals. In the latter, the blood is only a degree or two warmer than the medium in which they live, while in mammals and birds the blood greatly exceeds the outer temperature in heat. The average

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mammalian temperature varies from 99° F. to 100° F., as in man and his nearest allies, to 103° F. in the whales. In birds, which are the warmest-blooded animals, the lowest temperature is about 104° F., and may range to 110° or 112° F. This would represent an excessive fever heat in man. In hybernating animals the temperature falls considerably, as the tissue waste is reduced to its minimum. The production of heat depends on the union of oxygen in the blood with carbon and hydrogen in the tissues; active habits, as in birds, demanding a large supply of oxygen, and producing heat accordingly.

**Warming,** the act of making warm; the state of becoming warm or warmer. Warm-blooded animals require for health a certain temperature of the body, variable only within certain limits. If the external temperature become too high, the temperature of the body is regulated by perspiration and respiration; if it becomes low the bodily activity is increased, and the temperature thus kept up. Under ordinary circumstances, however, man needs to protect himself against excessive cooling, in order that he may lead the comparatively quiescent life of civilization; he needs houses and clothing. If this precaution be neglected his vitality sinks; and as the external temperature falls the death-rate rises, which shows that there is a certain amount either of neglect or inability, or both, to take the measures necessary to avoid undue cooling of the body. This undue cooling may be avoided in two ways — by extra clothing or by artificial heating of apartments. In Southern Europe and in China the former is the plan resorted to; in countries where fuel is not scarce the latter plan, which is preferable, is adopted.

The objects of artificial heating are the temperature most congenial to the human constitution, pure air to breathe, and air not too warm or dry. If the body be kept sufficiently warm the air which we breathe may be fairly cool; and an ideal system of warming would warm the body and leave the air cool and pure. The actual methods of warming are, to a greater or less extent, compromises, and they depend mainly either on radiation of heat or on convection of heat, or both. The former method is that of the open fire; the latter is, in the main, that of stoves, gas, steam, and hot water. In the former the walls and furniture of the room are warmed, while the air is not warmed directly by the fire, for the radiant heat streams through it without warming it; in the latter the air itself is warmed directly. In the former the walls are, so far as the fire is concerned, warmer than the air; in the latter the reverse is the case. In the former (the open fire) there is no tendency to deposition of moisture from the air on the walls, unless the air becomes laden with excess of moisture from extraneous causes, such as the presence of a numerous assemblage, or unless the air becomes chilled and deposits its moisture even on somewhat warmer walls; in the latter case, the walls being cooler than the air, there is a continuous tendency to the deposition of moisture on the walls, unless the air is at some distance from its saturation point.

Heating by radiation is best exemplified by the open fire with a chimney or in the open air. The drawbacks of the open fire burning in a grate are the waste of fuel through imperfect combustion, the production of smoke, the comparatively small radiative power of flame (a blazing fire having less effect than a glowing one), the warming of surrounding objects on one side only, the want of an equably maintained temperature, and the waste of heat, which escapes with the smoke and chimney gases. Its advantages are the satisfaction of the eye, cool air to breathe, and the ventilation produced. Smoke may be diminished and radiation increased by an extended use of coke; but coke does not do well if the fire burns low, and a blower should be used to make the fire draw quickly and become bright. A forced draught should always be used for a few minutes while lighting a fire; the amount of smoke produced is very materially diminished by this means. The forced draught is secured by narrowing the front aperture so that all the air which reaches the chimney must have passed through the fuel. If the aperture in front of the fire be large, air passes up to the chimney in front of the fire gases, and the combustion is relatively slow. Dr. Arnott developed the principle of limiting the access of air to the fuel by enclosing a store of fuel in an iron box beneath the grate, and bringing this gradually to the top by pushing up a false bottom; the air got access to the fire only at and near the top, and if the fire were left to itself it smouldered for many hours, ready to brighten up when it was pushed up so that air might gain free access to it.

In tending a fire it ought to be borne in mind that when the fire cannot radiate light it cannot radiate heat, and that it is therefore absurd to hide the fire under opaque masses of coal; and secondly, that the products of distillation of coal ought not to be allowed to escape as black smoke, but should pass up through a bright portion of the fire, and be perfectly burned. In special hearths it is possible by means of false bottoms, to introduce fresh charges of coal underneath the existing fire so that the outer surface of the fire is always clear and bright. Even in ordinary grates it is possible to do a good deal toward minimiz-

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ing smoke and confining the active portion of the fire to the top and front; if, for example, a tile be fitted in the bottom of the grate; if a substantial amount of fuel be put in the grate and lit at the top; if this fuel contain some broken coke or cinder; if fresh fuel be added, not by throwing it on the top, but by raking the fire forward, throwing the fresh fuel into the hollow thus produced at the back of the fire, and then pushing the bright fire back upon it; if these things be done the fire is obviously brighter and more continuously cheerful and more nearly smokeless. The fire should always be bounded by firebrick behind and on each side, for iron chills and blackens it.

The fire gases should not be allowed to escape at once into the chimney up a sloping iron back: but the back of the grate should be fire brick all the way up, and should overhang the fire so that the ascending fire gases impinge on it; by this means the "throat" of the chimney is prevented from being excessively wide, the back brick absorbs heat from the fire gases and radiates it towards the floor, and the back brick also reflects towards the room the heat radiated upward from the top of the fire. For similar reasons the regulator or register should slope forward. In every case, however, where there is flame there is great loss of heat, which escapes up the chimney, and even when the fire is smokeless this loss is considerable. The heat which is radiated into the apartment is never more than a fraction of the total heat of combustion of the fuel; and plans have been devised (see VENTILATION) for recovering some of this heat by causing it to warm the air which is supplied to the apartment.

In the more primitive plans in which there is no ventilation an open fire in a cave, tent, a wigwam, or a cabin, or a charcoal brazier in a room with a chimney, or a gas or petroleum stove isolated in a room — the whole heat of combustion of the fuel may be utilized in warming the walls and air of the room; but the products of combustion vitiate the air. Warming of this kind is effected by gas burners and petroleum lamps, which raise the temperature very considerably in non-ventilated rooms, but seriously vitiate the air at the same time.

By the use of close stoves the actual vitiation of the air by products of combustion is in great part avoided. The Dutch stove for example, is a hollow cylinder or other form of iron, standing on a stone slab on the floor, close at the top, and having bars at the bottom on which the fire rests. The door by which the coals are put in being kept shut, the air for combustion enters below the grate; and a pipe issuing from near the top carries the smoke into a flue in the wall. If this pipe be made long enough the fire gases traversing it may be very materially cooled down before they enter the chimney, and thus the bulk of the heat of combustion remains in the room. As far as mere temperature is concerned, this is a most effective and economical warming arrangement; but it has serious faults. The iron often becomes red-hot or even hotter; any carbonic oxide existing inside as the result of an adequate draught passes through hot iron and acts as a slow poison, causing anæmia; the dust in the air is charred when it approaches the hot metal, and gives rise to offensive and unwholesome odors; the air is rendered very "dry" by being strongly heated. These faults are more or less obviated by increasing the mass and the cooling surface of the stove so that it cannot become too hot externally when a moderate fire is kept up within; by regulating the fire; by adjusting the fire capacity of the stove itself; by allowing the access of sufficient air to ensure complete combustion; by surrounding the fire with brick instead of iron, or building the whole stove of brick or earthernware; and by placing a vessel of water upon the stove, the water evaporated from which may supply the moisture necessary to bring the air to a congenial degree of saturation, appropriate to its new temperature. If this vessel of water be placed on the stove the air takes up moisture from the evaporating pan, and does not then parch the skin and lungs; but when the room cools down again the air may readily prove supersaturated, and deposit moisture on the walls, a condition favorable to mold.

In most European stoves the fire is surrounded by a mass of brick. The smoke goes along a winding passage in the structure and issues nearly cold. The brickwork becomes warmed, and keeps up a moderate heat for a long time after the fuel has burned out. Open-fire stoves have also been devised; and an open fire grate might be built out into a room at a distance from the wall, and the flue might go at once into the chimney, or go up an ornamental column through the room above. By such means the waste heat of the chimney would be utilized in warming the air of the apartments.

Gas stoves have come into considerable vogue of late years. They depend either on radiation from luminous flames or from asbestos heated by Bunsen burners or on heating of a metal casing by Bunsen burners with or without direct contact between flame and casing. Bunsen flames are in themselves of no use for pure radiation, and bare flames without ventilation simply heat the air by pouring hot water vapor and carbonic acid into it, as any other fuel would do. In gas stoves as much as in open fires the products of combustion, though they are visible, must be taken out of the

room, and the means of access of these products to the chimney must be ample. The air of apartments is also frequently warmed by steam and hot water pipes; these are iron pipes containing hot steam or hot water, and warm externally by reason of the heat-conductivity of the metal. Air coming in contact with them is warmed and ascends, its place being taken by cooler and heavier air, which in its turn ascends. The whole air thus becomes warmed. Radiation from the pipes is also favored by a coat of paint, not by a smooth metallic surface. These systems lend themselves readily to distribution of heat throughout a building from one central point. The pipes can be so arranged that the steam or water can be shut off from any part at will; and the tubes may, by being connected with or attached to plates or wings of metal, have their heating surface and their heating efficiency increased.

Steam heating is useful where there is waste steam available, as in factories and railway trains. As long as steam goes on condensing it remains at 212° F. (100° C.) till it is wholly converted into water at 212° F.; overheating is thus not possible unless the steam is itself superheated at a high pressure. The pipes must be so laid, in the case of a building, that all condensed water may flow back into the boiler, and allowance must be made for expansion of the pipes by heat. When hot water is employed it may be made to circulate either at low pressure or at high pressure. In low-pressure systems the portion of the pipe which contains the coldest water should be vertical, and the comparative coolness of the water in the return pipes is maintained by the loss of heat experienced by the water on its way round the building. In high-pressure systems the pipe is narrower and very strong (wrought-iron of special make and thickness), and it forms a closed endless coil throughout the building. It is completely filled with water, except at the top, where there is a strong closed cylinder (the expansion tank) containing air to provide for the expansion of the water by heat. The pipe is led in a "boiler coil" round a fire at the basement. The water circulates for the same reason as in the low-pressure system, but it travels very rapidly, since the water can be heated in the boiler coil to temperatures far exceeding 212° F. This is because the whole apparatus is equivalent to a closed vessel, capable of standing great pressures, and in such a vessel water may be highly heated without attaining a boiling point. The apparatus is tested for pressures of 2,000 to 3,000 pounds per square inch, and at 750 pounds pressure it would be possible to heat the water to 510° F. The usual heat employed is from 300° to 350° F., which corresponds to a pressure of from five to nine atmospheres.

The advantage of the high-pressure system are the use of smaller pipes, which are more convenient and more seemly; the possibility of making them dip without risk of the bends being blocked by air (the removal of which must, on the low-pressure system, be provided for and attended to); the ease of application of radiating surfaces to the smaller tubes; the yielding of the system by alternate compression and release of the air in the expansion tank, which acts as an elastic cushion and tends to prevent fracture; the small quantity of water used, the rapidity of circulation and the consequent promptness of action; the freedom from any access of dirt to clog the tubes; and the advantageous form of the boiler coil as a rapid heater. In a modification of the system specially applicable to cases in which portions of the system are to be shut off from time to time, there are outlet and inlet safety valves to let hot water out or cold water in when the pressures are greater or less than certain limiting values. In these cases the air which is in the room is heated. The heating of air to be brought into a room will be found under VENTILATION (*q. v.*).

Small spaces may sometimes be warmed by the introduction of hot water, as railway carriages by hot water tins. Better than hot water is a tin case filled with crystallized acetate of soda; this is exposed to heat till it becomes warm; the heat absorbed is partly expended in melting the acetate, which then dissolves in its own water of crystallization; the mass therefore absorbs much heat; and as it cools down it keeps on liberating its latent heat for a protracted period.

As to conserving the warmth of a room by preventing heat from escaping, the leading methods are to make the walls, doors, etc., bad conductors and air tight. Air tightness is incompatible with ventilation, but bad conduction is desirable both in winter and summer. The best material for a badly-conducting wall is one of a porous or spongy texture, such as porous stone or brick, which contains air in its interstices; but the best structural form is that which contains a film or jacket of air. Even iron houses may be made warm in winter by this means, if plaster lined. Windows, again, if made double — double panes or, better, double sashes — allow very much less heat to escape than single ones, and even window blinds and curtains have to a smaller extent the same action. The intervening air film or layer is prevented from flowing away, and it is a very bad conductor.

**Warmoth, Henry Clay,** an American lawyer; born in McLeansboro, Ill., May 9, 1842; was admitted to the bar in 1861; en-

tered the Union army in 1862 as lieutenant-colonel, and participated in the battles of Chickasaw Bayou and Arkansas Post and in the assaults on Vicksburg, May 19–22, 1862; subsequently served on the staff of Gen. E. O. C. Ord, whose regiment he commanded in the campaigns against Gens. Stephen D. Lee and Nathan B. Forrest; and was present at the battles of Lookout Mountain and Missionary Ridge. He accompanied President Johnson on his "swing around the circle" through the Eastern and Northern States; became governor of Louisiana in 1868; and was military governor of that State till its new constitution was accepted by Congress, and was then inaugurated as civil governor and served till 1873. He was collector of customs at New Orleans in 1889–1893, and later became president of the New Orleans, Fort Jackson, and Grand Isle railroad.

**Warneck, Gustav Adolf** (vär'nek), a German theologian; born in Naumburg, March 6, 1834. He wrote: "Missions in the Light of the Bible" (1878); "The Relations between Missions and Modern Civilization" (1879); "The Mission in Pictures from its History" (1884); "Sketch of the History of Missions from the Reformation to the Present Time"; "The Ultramontane Art of Fence" (1889); "The Romanism of Today in the Light of its Missions to the Heathen" (1889); "The Evangelical Alliance and its Opponents" (1889); "Position of the Evangelical Mission Toward the Question of Slavery" (1889).

**Warner, Anna Bartlett,** pen name Amy Lothrop, an American author; born in New York, in 1820. In conjunction with her sister, Susan Warner, she published the novels "Say and Seal" (1860); "Wych Hazel" (1876); and "The Gold of Chickaree" (1876). Among her separate works, published under her pen name, are: "Dollars and Cents" (1853); "My Brother's Keeper" (1855); "Stories of Vinegar Hill" (1871); "The Fourth Watch"; "The Blue Flag," etc. (1879); "The Other Shore"; "Three Little Spades," a child's book; "Gardening by Myself"; "Up and Down the House"; "Pond Lily Stories"; "Miss Muff"; etc.

**Warner, Charles Dudley,** an American editor and author; born in Plainfield, Mass., Sept. 12, 1829; was graduated at Hamilton College in 1851; admitted to the bar in 1856, and practised in Chicago till 1860, when he removed to Hartford, Conn.; became editor of the "Press" in 1861, and of the "Courant" on its consolidation with the "Press" in 1867. He was connected with "Harper's Monthly Magazine," in charge of an editorial department for many years from 1884. His first book was a compilation for the use of students in schools, called "A Book of Eloquence" (1853). In 1870 he published "My Summer in a Garden," which was followed by "Saunterings" (1872); "Backlog Studies" (1872); "The Gilded Age" (with S. L. Clemens, 1873); "Baddeck, and That Sort of Thing" (1874); "Mummies and Moslems" (1876—reissued under the title "My Winter on the Nile"); "In the Levant" (1877); "Being a Boy" (1877); "In the Wilderness" (1878); "The American Newspaper" (1879); "Studies of Irving" (with W. C. Bryant and George P. Putnam, 1880); 'Life of Washington Irving" (1881); edited "American Men of Letters" (of this series "Washington Irving," 1881, was the initial volume; the thirteenth volume, "George William Curtis," by Edward Cary, appeared in 1894); "Captain John Smith, Sometime Governor of Virginia, and Admiral of New England: A Study of his Life and Writings" (1881); "A Roundabout Journey" (1883); "Papers on Penology" (with others; Reformatory Press, Elmira, N. Y., 1886); "Their Pilgrimage" (1886); "On Horseback: A Tour in Virginia, North Carolina, and Tennessee, Published with Notes of Travel in Mexico and California" (1888); "Studies in the South and West, with Comments on Canada" (1889); "A Little Journey in the World: A Novel" (1889); "Looking Forward: The Dual Government Realized" (1890); "Our Italy, Southern California" (1890); "As We Were Saying" (1891); "Washington Irving" (1892); "The Work of Washington Irving" (1893); "As We Go" (1893); "The Golden House: A Novel" (1894); "The Relation of Literature to Life" (1896); 'The People for Whom Shakespeare Wrote" (1897); edited "A Library of the World's Best Literature" (1896–1898). He died in Hartford, Conn., Oct. 20, 1900.

**Warner, Olin Levi,** an American sculptor; born in Suffield, Conn., April 9, 1844; early manifested a taste for sculpture; and first studied in the Ecole des Beaux Arts in Paris and later was a student in Carpeaux's studio. In 1872 he returned to the United States and opened a studio in New York city. In 1877 Daniel Cottier, an art dealer, invited him to place some of his work on exhibition in his rooms. This brought Mr. Warner's work under the eye of several critics who gave it favorable commendation. In 1877–1878 he modeled "Twilight," a small statue, which established his reputation. His works include "The Dancing Nymph"; "Cupid and Psyche"; reliefs of Joseph and other Indian chiefs; busts of J. Alden Weir, Miss Maude Morgan; and statues of Governor Buckingham of Connecticut, William Lloyd Garrison, General Devens; etc. He died in New York city, Aug. 14, 1896.

**Warner, Susan,** pen name ELIZABETH WETHERELL, an American novelist; born in New York, July 11, 1819. Her books are: "The Wide, Wide World" (1850); "Queechy" (2 vols. 1852); a theological treatise, "The Law and the Testimony" (1853); "The Hills of the Shatemuc" (1856); "Lyrics from the Wide, Wide World"; "The Golden Ladder" (1862); "The Old Helmet" (1863); "Wych Hazel" (1876); and an essay, "American Female Patriotism." She died in Highland Falls, N. Y., March 17, 1885.

**War Office,** in Great Britain, the department of government which controls all matters connected with the army. The head of the department is the secretary of state for war. He has a seat in the cabinet, and a salary of $25,000 a year is attached to his office. In the administration of the department he is assisted by a permanent under-secretary, who receives $10,000 per annum; by an assistant permanent under-secretary, a parliamentary under-secretary, a financial secretary, and the surveyor-general of ordnance. The government arms, ammunition, and clothing factories are controlled by the war office. The commander-in-chief has charge of all troops, regular and irregular, and is responsible for their discipline and efficiency. See WAR DEPARTMENT.

**War of 1812,** the second serious conflict between Great Britain and the United States. It lasted for over two and a half years, beginning June 19, 1812 and ending with the treaty of Ghent, which was signed Dec. 24, 1814, and ratified Feb. 18, 1815. The principal cause of this war was the interference of Great Britain with American vessels, which she caused to be stopped on the high seas and searched for British subjects who were forced into the navy or imprisoned for refusing to serve. Several times American men-of-war were fired on and compelled to give up seamen in their crews. Great Britain also interfered with our commerce by her blockades and Embargo Act, and a bitter feeling was aroused. James Madison, at that time President of the United States, was personally opposed to a war, but was overruled by Congress, which appropriated large sums for the army and navy. The following is a chronology of this war:

1812 Hull's expedition against Fort Malden.

Fort Mackinaw captured by the British and Indians.

Aug. 5—First Battle of Brownstown, Mich. British defeated the Americans under Van Horn.

Aug. 9—Second battle of Brownstown. Americans victorious.



Aug. 13—British sloop "Alert" taken by the United States ship "Essex" off Newfoundland.

Aug. 16—Hull surrendered the fort and city of Detroit.

Aug. 19—The "Guerrière," a British frigate, captured by the "Constitution" off Massachusetts.

Oct. 13—Battle of Queenston. Van Rensselaer wounded. Brock killed.

Oct. 13—Battle of Lewiston, N. Y.

Oct. 18—British ship "Frolic" captured by the United States ship "Wasp" off North Carolina.

Oct. 25—British ship "Macedonia" captured by the United States ship "United States" off Canary Islands.

Dec. 29—British frigate "Java" captured by the United States ship "Constitution" off Bahia, Brazil.

1813 Jan. 22—Battle of Frenchtown, Mich. Americans under Winchester defeated by the British General Proctor.

Feb. 24—British brig "Peacock" captured by the United States ship "Hornet" off Demarara, South America.

March 4—Madison began second presidential term.

April 27—Battle of York (now Toronto).

May 1—Fort Meigs was besieged by 2,000 British and Indians under Proctor, who are routed by General Clay with a force of Kentuckians.

May 29—Prevost makes an unsuccessful attack on Sackett's Harbor.

June 1—The United States ship "Chesapeake," Captain Lawrence, captured by the British ship "Shannon," Captain Broke, in Massachusetts Bay.

Aug. 3—Fort Stephenson, Ohio, defended by Major Crogan.

Aug. 14—American brig "Argus" captured by the British ship "Pelican" in the English Channel.

Aug. 30—The Creek Indian War.—Massacre of Fort Mimms, Ala.

Sept. 5—British brig "Boxer" captured by the United States ship "Enterprise" off Maine.

Sept. 10—Commodore Perry's victory over the British commanded by Captain Barclay at the W. end of Lake Erie.

Oct. 5—Battle of the Thames. Tecumseh, the Shawnee chief, killed and the Indian confederacy broken.

Nov. 9—General Andrew Jackson defeated the Creeks at Talledega, Ala.

Nov. 11—Battle of Chrysler's Field, Can.—Americans victorious.

1814 March 27—Battle of Horseshoe Bend, Ala.—Creek War ended.

March 28—American frigate "Essex" captured by the British ships "Phœbe" and "Cherub" off Chile.

April 29—British brig "Epervier" captured by the United States ship "Peacock" off Florida.

June 28—British sloop "Reindeer" captured by the United States ship "Wasp" near the British coast.

July 3—Americans under Generals Scott and Ripley captured Fort Erie, Canada.

July 5—Battle of Chippewa, Canada.—Scott defeated the British under Riall.

July 25—Battle of Lundy's Lane, Canada.

Aug. 15—First battle of Fort Erie.—British force of 5,000 men repulsed.

Aug. 24—British under Ross dispersed Americans at Bladensburg, Md.

Aug. 24—Washington, D. C., captured by the British under Ross. Public buildings burned.

Sept. 11—Battle of Lake Champlain. Captain Downie, British, surrendered his fleet to Commodore McDonough.

Sept. 11—Battle of Plattsburg, N. Y. Prevost, British, defeated by Americans under McComb.

Sept. 12—Ross, British, defeated Americans at North Point, Md. Death of Ross.

Sept. 13—Brooks bombarded Fort McHenry, Md., but withdrew without reducing the fort.

Sept. 15—Fort Boyer, Mobile Bay, bombarded by the British without success.

Sept. 17—Second battle of Fort Erie. Gen. Jacob Brown dispersed besiegers.

Nov. 7—Gen. Andrew Jackson drove the British from Pensacola, Fla.

Dec. 14—American flotilla surrendered to the British at Lake Borgne, La.

Dec. 23—Preliminary battle nine miles from New Orleans, La.—Gen. Andrew Jackson retired to intrenchments.

Dec. 24—Treaty of Ghent, Belgium, peace between Great Britain and the United States signed.

1815 Jan. 8—Battle of New Orleans.—Fourteen days after treaty of peace. (The British General Packenham lost 2,000 men, and was killed.—The Americans lost seven men.)

Jan. 15—British squadron captured the United States frigate "President" off the coast of New Jersey.

Feb. 20—British ships "Cyane" and "Levant" captured by the United States ship "Constitution" off Madeira Islands.

March 23—British brig "Penguin" captured by the United States ship "Hornet" off Brazil.



**War of the Barons.** See BARONS' WAR.

**War Paint,** paint put on the face and other parts of the body by North American Indians and other savages on going to war, with the object of making their appearance more terrible to their enemies.

**War Path,** the route or path taken on going to war; a warlike expedition or excursion; used chiefly in regard to North American Indians. On the warpath, means on a hostile or warlike expedition; hence, colloquially, about to make an attack on an adversary or measure.

**Warping,** in agriculture, a process for adding to and enriching the soil by means of detritus carried down by rivers, or borne inland by the flowing tide. The operation, which consists in inclosing a body or sheet of water till the sediment it holds in suspension has deposited, can only be carried out on flat low-lying tracts which may be readily submerged. It is analogous to the natural process of fertilization effected in Egypt by the Nilotic floods, and though little practised in the United Kingdom, it is of importance near the mouths of many European rivers.

**War Prizes, Distribution of Value,** the judicial apportionment of the proceeds of sale of condemned prizes of war. If a captured vessel of an enemy or a neutral contains munitions of war all such property is confiscated and passes to the government of the capturing vessel. Where the prize vessel is of superior or equal force to the captor vessel the net proceeds of the sale of vessel and cargo is awarded under the statute to the captors; and where the prize is of inferior force, one-half of the net proceeds goes to the government, and the other half to the captors. All vessels of the navy which aid a captor in securing a prize share with it in the proceeds. The distribution of prize money among the men taking part in the capture is substantially on the following basis: To the comanding officer of a fleet or squadron, one-twentieth part of all prize money awarded to any vessel or vessels under his immediate command. To the commanding officer of a division of a fleet or squadron on duty under the orders of the commander-in-chief of such fleet or squadron, one-fiftieth part of any prize

money awarded to a vessel of such division for a capture made while under his command; but such part shall not be in addition to the share he would be entitled to as commander of the vessel making or aiding the capture. To the fleet captain, one-hundredth part of all money awarded to any vessel or vessels of the fleet or squadron in which he is serving; but if the capture is made by the vessel on which he is serving at the time, he will share in the award with all the officers and men on the vessel in proportion to his annual pay. To the commander of a single vessel, one-tenth part of all awards to his vessel, when the vessel at the time of the capture is under the orders of a superior officer, and three-twentieths when the vessel is independent of such other officer. After this apportionment, the residue of prize money is distributed among all others on duty on the capturing or assisting vessel or vessels at the time of the capture, in proportion to their rates of pay in the service. The law also provides a special bounty where an enemy's vessel is sunk or otherwise destroyed in an engagement, and the officers and crew thus lose the opportunity for acquiring prize money. This bounty is $100 for each person on board an enemy's ship or vessel of war at the beginning of an engagement resulting in its destruction, and is distributed among the officers and crew of the vessel or vessels taking part in the destruction in proportion to their regular pay.

**Warrandice,** in Scotch law, an obligation by which the party conveying a subject or right is bound to indemnify the grantee, disponee, or receiver of the right, in case of eviction, or in case of real burdens having been created over the subject before the date of conveyance. Warrandice is personal, or real. The former binds the grantee and his heirs personally. By the latter, real estate is conveyed in security of the guarantee.

**Warrant,** to give a guaranty to; to authorize; to give power or authority to, as to do or forbear anything, by which the person authorized is secured or held harmless from any loss, damage, or detriment by such act; as, these thoughts cannot warrant you from suspicion in others. To declare with assurance or confident anticipation; as, I warrant he who is born to be hanged will never be drowned. To justify; to maintain, support, or verify by authority, proof, or evidence; as, one is warranted in assuming this to be a fact. In law, to assure; to secure to, as a grant to a guarantee. To secure, as the valid title of goods to a purchaser; or, to provide indemnification in the event of loss. To guarantee to a purchaser the quality or quantity of goods or articles sold, as being equal to that which they are represented to be; as warranted Sheffield cutlery.

An act, instrument, or obligation, by which one person authorizes another to do something which he has not otherwise a right to do; an act or commission investing one with a certain right, power, or authority, and thus securing him from loss, damage, or detriment; anything which warrants authorizes, or justifies the doing of; as, the breaking of rules by others is no warrant for our doing so likewise. That which serves as guaranty, security, or assurance for anything; as, his word alone is sufficient warrant. A voucher; that supplies proof or attestation; as, a pretender to piety backs his imposture by Scriptural warrant. A writing or document which empowers a person to receive money, goods, or other thing or things; as, a warrant for the transfer of bonded spirits.

In criminal law, the authority issued by a justice of the peace for the apprehension of some one. The warrant should be under hand and seal of the justice; should set forth the time and place of making it, and the cause for which it is made; and should name the person against whom it is granted. It is good for the county in which it is issued, but cannot be enforced in another without being backed by a justice of that county. The officer is justified in apprehending the party at any time, and even in breaking open the doors of a house in pursuit of him.

**Warrant of Attorney,** an authority by which one person authorizes another to act for him in a certain matter. Also an instrument by which a person authorizes another to confess judgment against him in an action for a certain amount named in the covenant of attorney. It is generally given as security by one who is about to borrow money. If necessary the creditor obtains judgment without the delay, expense, and risk of an action.

**Warrant Officer,** one of the highest ranks to which seamen under ordinary circumstances can attain. They are divided into three classes — gunners, boatswains, and carpenters, the gunners taking precedence of the other two. Formerly, before ironclads superseded wooden ships, there was only one officer of this rank of each class carried on board even the largest ships. Now, in addition to the officer of each class appointed to carry out the special duties of gunner, boatswain, and carpenter on board every ship, there are usually three or four junior gunners or boatswains appointed to battleships and some of the larger of other classes of ships to perform what are called quarter-deck duties, in addition to which in many of the larger ships an extra gunner or boatswain is appointed for torpedo duties. A certain proportion of these officers who have duly

qualified in navigation are now appointed to command torpedo boats.

**Warranty,** in law, a promise or covenant by deed, made by the bargainer, for himself and his heirs, to warrant or secure the bargainee and his heirs against all men in the enjoyment of an estate or other thing granted. The use of warranties in conveyances has long been superseded by covenants for title, whereby, as the covenanter engages for his executors and administrators, his personal as well as his real assets are answerable for the performance of the covenant.

Also, any promise (express or implied by law, according to circumstances) from a vendor to a purchaser, that the thing sold is the vendor's to sell, and is good and fit for use, or at least for such use as the purchaser intends to make of it. Warranties in insurance are absolute conditions, non-compliance with which voids the insurance. When express, these warranties should appear in the policy, but there are certain implied warranties.

**Warren,** in ordinary language, a piece of ground appropriated to the breeding and preservation of game or rabbits; also, a preserve for fish in a river. In English law, a franchise or place privileged by prescription or grant from the crown for keeping beasts and fowls of warren, which are hares, rabbits, partridges, and pheasants, though some add quails, woodcocks, and water fowl. The warren is the next franchise in degree to the park, and a forest, which is the highest in dignity, comprehends a chase, a park, and a free warren.

**Warren,** a city and county-seat of Trumbull co., O.; on the Mahoning river, and on the Pittsburg and Western, the Pennsylvania, and the Erie railroads; 55 miles S. E. of Cleveland. Here are union graded schools, Musical Institute, waterworks, street railroad and electric light plants, National and State banks, and several daily and weekly newspapers. The city has machine shops, planing, flour, rolling, paint, and saw mills, boiler, linseed oil, evaporator and tube works, and steel bath tub, electric lamp, and other factories. Pop. (1890) 5,973; (1900) 8,529; (1910) 11,081.

**Warren, Gouverneur Kemble,** an American military officer; born in Cold Spring, N. Y., Jan. 8, 1830; was graduated at the United States Military Academy in 1850, and was brevetted 2d lieutenant of Topograhpical Engineers; was engaged in river surveys, and in exploring and making maps for railroad routes between the Mississippi river and the Pacific Ocean in 1850–1859; and was assistant Professor of Mathematics at the United States Military Academy in 1859–1861. When the Civil War broke out he became lieutenant-colonel of the 5th New York Volunteers and colonel in August, 1861. He was promoted captain of United States Engineers, Sept. 9, 1861; promoted Brigadier-General of volunteers in September, 1862, for his gallantry at Gaines's Mills, and chief of topographical engineers in February, 1863. In March of the same year he was made chief of engineers in the Army of the Potomac. During the battle of Gettysburg, while on the staff of General Meade, he ordered the 140th New York regiment to seize Little Round Top. After a sharp hand-to-hand struggle this hill, which was the key to the whole Union position, was carried. He was promoted Major-General of volunteers in May, 1863, and in March, 1864, when the Army of the Potomac was reorganized he was placed in command of the 5th corps. He distinguished himself in the battles of Marye's Heights, Chancellorsville, Salem, the Wilderness, North Anna, Bethesda Church, Cold Harbor, Five Forks, etc. At the instance of General Sheridan, who accused General Warren to General Grant of criticizing the acts of his superior officers, he was relieved from the command of his corps, but was later vindicated by a court of inquiry. Shortly after this he was placed in command of the Department of the Mississippi. In June, 1864, he was promoted major of United States Engineers, which post he assumed in May, 1865, when he was mustered out of the volunteer service. He was brevetted Major-General U. S. A. in March, 1865, and promoted lieutenant-colonel in March, 1874. His publications include: "Explorations in the Dakota Country" (1855–1856); "Preliminary Reports of Explorations in the Nebraska and Dakota in the Years 1855–1857" (1858); and "An Account of the 5th Army Corps at the Battle of Five Forks" (1866). He died in Newport, R. I., Aug. 8, 1882. A statue was erected to his memory on Little Round Top, Gettysburg, Pa., in 1888.

**Warren, Joseph,** an American patriot; born in Roxbury, Mass., June 11, 1741. He was graduated at Harvard College in 1759, studied medicine, and settled in Boston, where he soon acquired an extensive practice. He warmly embraced the cause of the colonies in the controversy with the British government, and, in 1772, was made a member of the committee of correspondence formed for the purpose of communication with the several towns in Massachusetts. In 1774, he was elected a delegate to the Massachusetts congress, of which he was made president, and also chairman of the committee of public safety. On June 14, 1775, he received a commission as Major-General; and when a majority of the council of war determined to fortify Bunker Hill, he insisted on having a share in the action that would take place. As he was warned by Elbridge Gerry against the haz-

ard of exposing his person: "I know that I may fall," was the answer of Warren, "but where is the man who does not think it glorious and delightful to die for his country?" He was killed at the battle of Bunker Hill, June 17, 1775. His statue, by Henry Dexter, was unveiled on Bunker Hill, June 17, 1857.

**Warren, Mercy Otis,** an American patriot; born in Barnstable, Mass., Sept. 25, 1728. An ardent patriot, she corresponded with the leaders of the Revolution, among them Samuel and John Adams, and Thomas Jefferson. The "Correspondence of John Adams and Mercy Warren" was published by the Massachusetts Historical Society in 1878. She wrote dramatic and satirical poems against the Royalists (1773–1775), which were included in her volume of "Poems, Dramatic and Miscellaneous" (1790). She published "A History of the Rise, Progress, and Termination of the American Revolution, Interspersed with Biographical, Political, and Moral Observations" (3 vols. 1805). She died in Plymouth, Mass., Oct. 19, 1814.

**Warren, Samuel,** a British novelist; born in Denbighshire, Wales, May 23, 1807. He studied medicine at Edinburgh and law at the Inner Temple, and was called to the bar in 1837. He was made a Queen's Counsel (1851), was Recorder of Hull (1854–1874), represented Midhurst in the Conservative interest (1856–1859), and then he was appointed one of the two Masters of Lunacy. His "Passages from the Diary of a Late Physician" (1832) had been contributed to "Blackwood's Magazine," as also was "Ten Thousand a Year" (1841), the amusing story of "Tittlebat Titmouse." By these he is chiefly remembered; but he published a dozen more works, including "Now and Then" (1847), "The Lily and the Bee" (1851), and several law books. He died in London, July 29, 1877.

**Warren, William Fairfield,** an American educator; born in Williamsburg, Mass., March 13, 1833; was graduated at Wesleyan University in 1853; ordained in the Methodist Episcopal Church in 1855; and was Professor of Systematic Theology at the Mission Institute, Bremen, Germany (now the Martin Institute, Frankfort), for several years. He was appointed acting president of the Boston Theological Seminary in 1866; accepted the presidency of Boston University in 1873, and also the chair of philosophy of religion and comparative theology. His publications include "Paradise Found: the Cradle of the Human Race at the North Pole" (1885); "The Quest of the Perfect Religion" (1886); "Constitutional Law Questions in the Methodist Episcopal Church" (1894); "The Religions of the World and the World Religion" (1900); etc.

**Warren, Fort,** one of the defenses of Boston harbor.

**Warriner, Edward Augustus,** an American clergyman; born in Agawam, Mass., Feb. 19, 1829; was graduated at Union College in 1855; studied law and practised for three years in Springfield, Mass. He then studied theology and was ordained in the Protestant Episcopal Church in 1868; became pastor of St. Paul's Church, Montrose, Pa. His publications include "Victor La Tourette, a Theological Novel" (1875); "I Am That I Am, The Idea of God" (1887); "The Gate called Beautiful — an Institute of Christian Sociology" (1898); etc. He died in 1908.

**Warrington,** a municipal and parliamentary borough and manufacturing town of Lancashire, England, on the right bank of the Mersey, 18 miles E. of Liverpool, 16 W. S. W. of Manchester, and 182 N. W. of London. Though of recent development, it is an ancient place, the Wallingtun of Domesday; and, acquiring strategic importance through its bridge (1496)) over the Mersey, it was the scene of defeats of the Scots (1648), the Royalists (1651), and a portion of Prince Charles Edward's forces (1745. To a dissenting academy, founded in 1757, it owes its memories of Drs. Aikin, Priestley, Taylor, etc.; and Lucy Aikin was a native. The parish church, St. Elphin's, with a spire 300 feet high, is a fine cruciform Decorated structure, restored in 1859–1867 at a cost of over $75,000. Other buildings are the town hall, the Royal Court theater (1862), postoffice (1876), hospital (1876), museum and library (1857), school of art (1882), public baths (1866), grammar school (1526; rebuilt 1857), etc. There are also public gardens and a park. The manufactures include iron, wire, pins, files, cottons, glass, leather, and soap. Pop. (1901) 64,241.

**War Risk,** a name given by insurance men to policies written on property obnoxious to destruction or damage by reason of a war then being waged; applied generally to marine insurance.

**Warsaw,** a city of Russian Poland; formerly the capital of the Polish kingdom; situated on the Vistula, being connected with Praga, its fortified suburb, by a floating bridge. Warsaw consists of an old and new town, independent of its suburbs; the place is one of great antiquity, though possessing few attractions in its streets and older buildings to support its claim as a capital, being, with the exception of a few buildings, wretchedly built. The chief edifices are the council house, a collegiate church, the barracks, Tamek or palace of the ancient kings, now the residence of the Russian viceroy, and containing the diet hall, and all the national archives; the Marieville Bazaar, or a square surrounded with

arcades; several statues, some private palaces of the nobility, with the castle and an equestrian statue of Sobieski. The manufactures are woolen stuffs, soap, tobacco, gold and silver wire, hats, hosiery, paper, chemicals, carriages, harness, and, to a small extent, carpeting. It is the center of industry, commerce, and literary activity of the kingdom, and the great entrepôt of commerce in Poland. The university, suppressed by the Emperor Nicholas after the insurrection of 1830, was subsequently reëstablished through the influence of the Grand-Duke Constantine. In 1566 Warsaw succeeded Cracow as the capital of Poland. In 1793 Kosciusko retreated on Warsaw, and defended it with success against the Prussians, during the summer of 1794; but, on the arrival of Suwarrow and the Russians, Praga, a suburb of the city, was taken and destroyed. For many years Warsaw has been the residence of a viceroy representing the Emperor of Russia; it was also the place of meeting of the Polish parliament. In 1830 the Russians were driven from it by the Poles; but it was, in the following year, retaken. Pop. (1897) 638,209. See POLAND.

**Warship,** an armed vessel, built for the purpose of waging war on the water; a naval vessel. Warships have always been an important factor in the armament of those states which have a portion or the whole of their territory contiguous to the seas of the world. In no branch of warfare have the means of offense and defense been, in a few years, the subject of so much change, both in type and effectiveness, as in naval construction and armament. For many centuries after the invention of firearms the progress in the direction of invulnerable warships was very slow, and it was not till the naval operations of the American Civil War had given to the civilized nations of earth a great object lesson that the development of ships as fighting machines was accelerated. Prior to that time the strength of naval vessels was considered to lie entirely in the number of men and guns that a ship carried. The building by the Confederate government of the iron-clad ram "Virginia" directed attention to the value of armor-clad ships, and especially such ships when armed with a beak or ram, as a means of offense. The construction by Captain Ericsson of the "Monitor," and the successful fight of that vessel against the "Virginia," convinced naval architects that the wooden warship had suddenly become obsolete.

From this point the development of strength in warships is marvelous. Each civilized nation vied with the other in the production of what was vainly imagined would prove invincible and invulnerable ships, but as fast as the defensive power of armor was increased the offensive power of the guns with which other ships were armed was augmented. This led to a great reaction in the methods of naval construction, and the efforts of engineers were directed to the production of warships of the swift cruiser type, rather than that of the battleship, and for awhile the United States government constructed only swift armored and protected cruisers. The first contract for first-class battleships for the United States navy was signed in 1890, and they were officially designated "coast-line battleships." They were three in number, named respectively the "Oregon," the "Indiana" and the "Massachusetts." The first of these to be completed was the "Indiana" in November, 1895. Half a year later the "Massachusetts" was commissioned, and a month later the "Oregon." See BATTLESHIP: DREADNAUGHTS, NAVY.

**Warship, Classification of,** the division of the vessels in a navy according to rating and type. In the United States navy the basis of rating is the displacement of a vessel, or, practically, its weight. All vessels having a displacement of 5,000 tons and upward are classed as first rates; those between 5,000 and 3,000 tons as second rates; those between 3,000 and 1,000 tons as third rates; and those below 1,000 tons as fourth rates. The classification by type is first and second-class battleships; armored, protected, partially protected, and unarmored cruisers; barbette, single and double-turret monitors; auxiliary cruisers, consisting of large and swift mercantile steamships, partially protected and armed; gunboats; torpedo boats; tugs; patrol boats, adapted from ocean-going tugs and swift steam yachts; and a variety of special vessels such as the dynamite gun vessel "Vesuvius," the harbor defense ram "Katahdin," and the torpedo ram "Alarm." The special vessels provided for the war with Spain included large hospital and ambulance ships; a vessel equipped as a mammoth machine shop, with a large force of skilled workmen to make instant repairs to disabled fighting ships; and vessels fitted up to carry coal, food, ice, and water. The classification by rating differs from that by type. All the battleships are first rates; one double-turret monitor, the "Puritan," is a first rate; all other double-turret monitors are second rates; the cruisers are distributed among the four rates; and the gun boats are third and fourth rates.

In general, first-rate ships are named after the States of the Union; second rates after cities in the United States; third rate after important events or names connected with the naval history of the United States; fourth rates after lakes and rivers in the United States; and special vessels for the distinctive service for which they are de-

signed, as the hospital ship "Solace"; the naval repair ship "Vulcan," etc. The monitors as a class are named after rivers and American Indians. All the first-class battleships in service or under construction have a displacement of more than 10,000 tons; five are of 11,525 tons each, three of 10,288 tons, and one of 11,410. The ill-fated "Maine" was a second-class battleship and had a displacement of 6,682 tons, and her only sister ship, the "Texas," has a displacement of 6,315 tons.

**War Song,** a song having war or warlike deeds for its subject, or one that incites to war; more specifically, such a song sung by soldiers about to charge the foe, or by warriors at a war dance. The following is a list of the principal war songs of various nations:

*American.*—"Battle Cry of Freedom," the "Battle Hymn of the Republic," and "Marching Through Georgia," sung by the Union soldiers in the Civil War (1861–1865); "Dixie's Land" and "Maryland, My Maryland," sung by the Confederates.

*Austrian.*—Haydn's "Hymn to the Emperor."

*Belgian.*—The patriotic "Brabançonne."

*Danish.*—The "Song of Danebrog." The danebrog is the flag with a white cross which fell from heaven in the 13th century at the prayer of Waldemar II., and which ensured him the victory.

*English.*—"Rule Britannia." Words by Thomson, music by Handel.

*French.*—(Ancient), the "Chanson de Roland" ("Song of Roland").

*French.*—(Modern) the "Marseillaise" ("The Marseilles") and the "Chant du Départ" ("Parting Song").

*German.*—(Modern), Arndt's "Des Deutschen Vaterland" ("The German's Fatherland"), and "Heil Dir im Siegerkranz" ("Hail to Thee in the Conqueror's Wreath" "Watch on the Rhine," "Sword-song of Körner," etc.

*Hungarian.*—The "Rakoczy March."

*Italian.*—Garibald's warlike hymn, composed by Mercantino, and Godfredo Mameli's "Italian brethren, Italy has awaked!"

*Russian.*—"God Protect the Czar!"

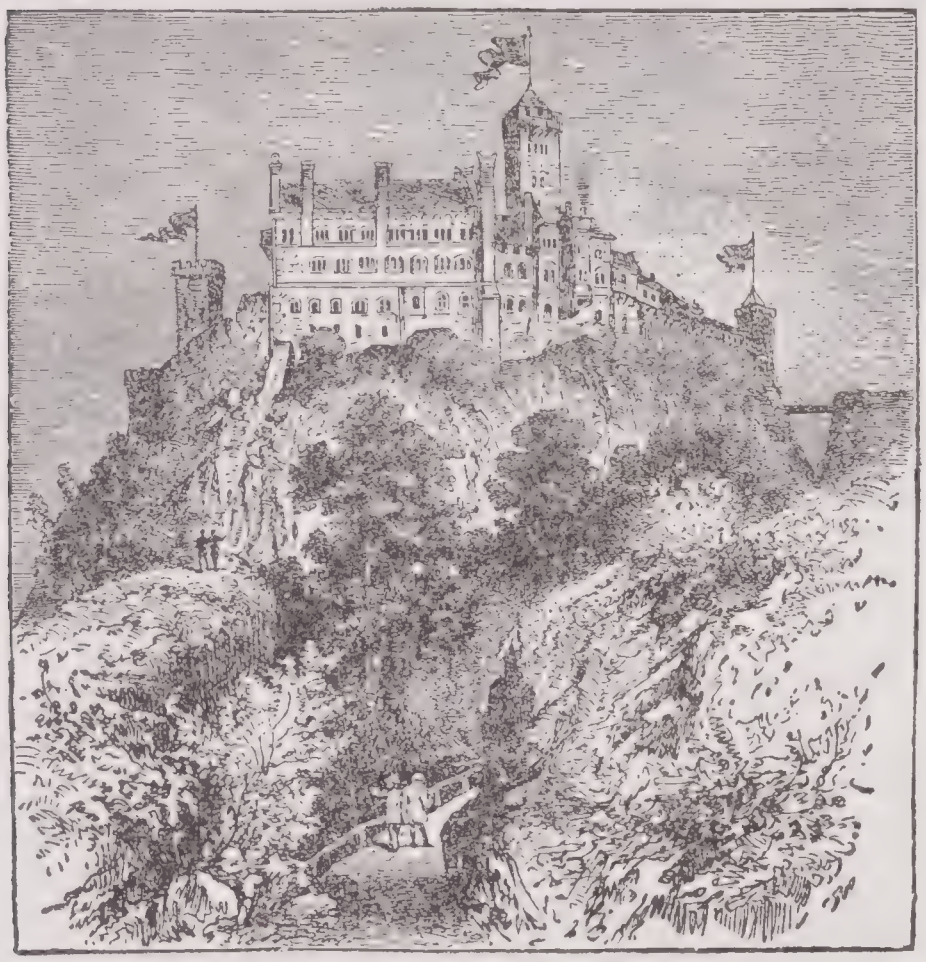
*Scotch Jacobite Songs.*—"The King shall enjoy his own again," and "When the king comes o'er the water." The "Lillibulero" of 1688 created a most marvelous furor.

**Wart,** known in surgery by the Latin name *Verrucæ*, a collection of lengthened papillæ of the skin, closely adherent and ensheathed by a thick covering of hard dry cuticle. From friction and exposure to the air the surface presents a horny texture, and is rounded off into a small button-like shape. Such is the description of the simple wart, which is so commonly seen on the hands and fingers (and rarely on the face or elsewhere) of persons of all ages, but especially of children. Among other varieties of warts are (1) one to which the term *Verruca digitata* has been applied. It is more elongated in shape, and less protected by cuticle than the preceding. It is said to occur nowhere but on the scalp of women of adult age, and sometimes to occasion great annoyance in brushing and combing the hair. (2) Subungual warts, growing, as their specific name implies beneath or at the side of the finger or toe nails. They originate beneath the nail, and as they increase they crop out either at the free extremity or the side of the nail, and are usually troublesome, and often very painful. They are generally of syphilitic origin. (3) Venereal warts, caused by the direct irritation of the discharges of gonorrhœa or syphilis, and occurring about the parts which are liable to be polluted with such discharges. They attain a larger size, and are more fleshy and vascular than other warts.

Nothing is known of the cause of warts further than that the third variety is induced by an irritating discharge, that the malignant form of wart which is the beginning of chimney-sweepers' cancer is caused by the irritation of soot, and that persons engaged in dissection and post-mortem researches are especially liable to them; hence we may infer that they are always due to some local irritation. Venereal warts are certainly contagious; with regard to others, we cannot speak positively. According to popular belief, blood from a wart is capable of producing similar warts when applied to the skin, and occasionally, but rarely, this has been the case in the experience of surgeons. In consequence of the capricious way in which warts often undergo spontaneous cure, there are numerous popular charms for their removal, several of which may be found recorded in the pages of "Notes and Queries." Common warts are so apt to disappear that they may be often left to themselves. If it is desired to remove them, glacial acetic acid may be applied with a camel-hair pencil till the wart is pretty well sodden, care being taken not to blister the neighboring skin. One or at most two applications are usually sufficient. Nitrate of silver and tincture of iron are popular and general applications. Salicylic acid in collodion is also very effective. Small warts hanging by a neck may often be very simply removed by the tight application of an elastic ligature (*e. g.* a small broken elastic ring) to the base. The wart usually shrivels up and falls off within a week. The other varieties of warts must be left to the surgeon.

**Wartburg, Castle of,** a notable structure in Eisenach, Saxe-Weimar, on an eminence rising 600 feet above the town, engirt by forests, founded in 1067, and till 1440

the residence of the Landgrave of Thuringia. It is famous as the spot where the MINNESINGERS (*q. v.*) assembled to hold a poetic contest ("the war of the Wartburg") about 1207; as the home of St. Elizabeth (1511–1527); and as the 10 months' asylum to which Luther was carried by the Elector of Saxony (May, 1521). The chapel in which Luther preached, as well as the chamber which he occupied, and in which he discomfited the Evil One by throwing the inkstand at his head, is still pointed out. The whole pile has been magnificently restored since 1851.



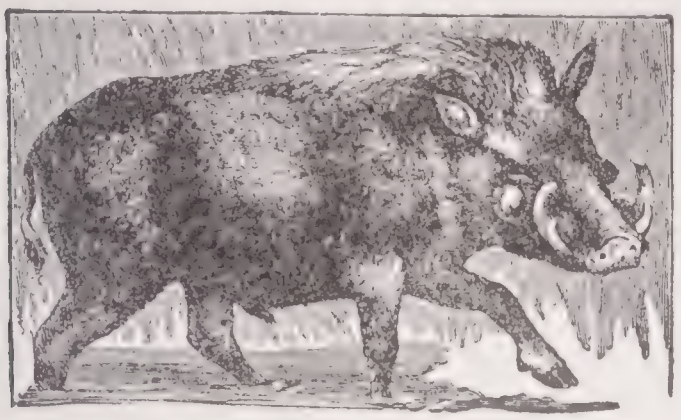
WARTBURG CASTLE.

**Wartburg, War of the,** a poetic contest between the most famous minstrels of the day, said to have taken place at the castle of Wartburg, in 1206 or 1207. The strife is described in a celebrated poem by an unknown author, of date about 1290, and written in Middle High German. The poem consists of two parts. In the first we are told how Heinrich von Ofterdingen sings the praises of Duke Leopold of Austria, while Walther von der Vogelweide extols the deeds of the Landgraf of Thüringia. In this strife Walther is victorious. The second part (of much later origin) tells how the magician Klingsor, from Hungary, comes at the call of the discomfited minstrel. A sharp trial of wit ensues between the newcomer and Wolfram von Eschenbach, in which the latter triumphs. The fact that some sort of a poetic contest did probably take place at Castle Wartburg about the time indicated does not at all prove the authenticity of the alleged account, of which the incidents are pure fiction. The best edition, with translation into modern German, is by Simrock (Stutt. 1858). The story is treated in Wagner's "Tannhäuser."

**Warthe,** the principal tributary of the Oder river; rises near Kromolov, in Poland; flows N.; at Kolo turns to the W.; at Schrimm again to the N.; at Obornik to the W.; at the influx of the Obra finally to the N.; at the influx of the Netze enters on the Wartebruch, a swampy tract 46 miles long by 9 wide, and joins the Oder at Küstrin, where it is 640 feet broad. Its tributaries are, from the right the Netze and Küddow, from the left the Prosna and Obra. Its total length is 487 miles, of which 222 miles belong to Prussia.

**Wart Hog,** the *Phacochœrus*, a genus of *Suidæ*, closely resembling the true hogs in most of their characters, and particularly in their feet, but remarkably differing from them in their dentition: The number of teeth is much reduced; the canines become the large tusks, and in the adult the last molar only is found in each jaw, which grows to an enormous size as in the elephant. The head is very large, and the muzzle very broad; the cheeks are furnished with large wart-like excrescences, so that the appearance is altogether very remarkable and uncouth. The species are all natives of Africa. They feed very much on the roots of plants, which they dig up by means of their enormous tusks. The African wart hog, or haruja (*P. œliani*), a native of Abyssinia and of the central regions of Africa, from the coast of Guinea to that of Mozambique, is nearly four feet long, with a naked slender tail of one foot, is scantily covered with long bristles of a light-brown color, and has a mane sometimes 10 inches long, extending from between the ears along the neck and back. Another species is found in the S. of Africa (*P. œthiopicus*), the valke vark of the Dutch colonists at the Cape of Good Hope. The incisors of the latter fall out at an early age, those of the former are persistent. A closely allied genus is *Potamochœrus*, of which there are several species, as the bosch vark of Cape Colony (*P. africanus*), which is nearly black, with whitish cheeks having a central black spot, and the painted pig of West Africa (*P. penicillatus*), which is reddish, with black face, forehead, and ears; another and less known species is *P. edwardsi* from Madagascar. The species of *Potamochœrus*

frequent swampy grounds, and sometimes receive the name of water hog. They have longer ears than the true wart hogs, tapering and ending in a pencil of hairs; the face is elongated, and has a huge protuberance



WART HOG.

on each side. The flesh of all the wart hogs and water hogs is in high esteem. They are hunted by dogs, which are often killed in the encounter with them. They are much addicted to fighting among themselves. This genus differs from *Sus* in that there are only four young in a litter, and that one molar tooth in each jaw has disappeared.

**Warton, Joseph,** an English clergyman, critic, and editor; born in Dunsford, England, in 1722. He wrote: "Odes on Various Subjects" (1746); a poetical translation of the "Eclogues and Georgics of Vergil" (1753); 24 critical papers to the "Adventurer" (1753–1756); an "Essay on the Genius and Writings of Pope" (2 vols. 1856–1882). He edited the works of Pope (9 vols., 1797); and the works of Dryden (4 vols., 1811; completed after his death). He died in Wickham, Feb. 23, 1800.

**Warton, Thomas,** an English poet and critic, son of the Rev. Thomas Warton, Professor of Poetry at Oxford; born in Basingstoke, England, in 1728. He was educated at Winchester, and Oxford, and early distinguished himself by his poetical compositions and criticisms. He was chosen Professor of Poetry at Oxford in 1757, a chair he filled with great ability for 10 years; appointed Camden Professor of History in 1785; and he succeeded Whitehead as poet-laureate in the same year. Several church livings were also held by him. He rendered great service to literature by his "History of English Poetry" (1774–1781, three vols.), a work never completed. He died in Oxford, May 21, 1790. His brother, Joseph (1722–1800), also deserves mention as a literary critic, and as headmaster of Winchester School (1766–1796). To him we owe an essay on the "Writings and Genius of Pope."

**Wart Snakes,** the family *Acrochordidæ*, consisting of two genera of innocuous colubriform snakes (formerly grouped with the *Hydrophidæ*), from the Oriental region. They are non-venomous and viviparous; the tail is prehensile, and the body and head are covered with wart-like scales, which do not overlap. One species, *Chersydrus granulatus*, is aquatic.

**Warville, Brissot de.** See Brissot, Jean Pierre.

**Warwick** ("the fortified place"), the county town of Warwickshire, England, 107¾ miles N. W. of London; chiefly situated on the S. shore of the Avon. On the opposite bank, crowning a solid rock, stands Warwick Castle, rearing its towers, Cæsar's (147 feet) and Guy's (128 feet), above the cedars of the surrounding park, and storing within its state apartments rich tapestries, pictures by Rembrandt, Van Dyck, and Rubens, collections of armor and other rarities, among them the famous "Warwick vase." The restoration of its hall, gutted by fire in 1871, was completed (1876) at a cost of some $90,000. St. Mary's Church, mainly rebuilt in 1704, retains its old Perpendcular choir and Beauchamp chapel (1370–1391), with the tombs of four centuries of Warwick's earls; over the E. gate is an ancient chapel, till recently used as a free school; and Leicester's Hospital, founded for 12 brethren in 1571, is a quaint quadrangular building, with a Gothic chapel surmounting the Warwick Gate, a mighty kitchen, and vaulted hall, profusely adorned with its founder's cognizance, the Bear and Ragged Staff. The town itself, having suf-

WARWICK CASTLE.

fered much from fire, is generally modern, among the recent buildings being a Roman Catholic Church (1860), the county hall and courts, a domed market house, the county jail (1860), a theater, and antiquarian museum; and new waterworks were constructed (1876) at a cost of nearly $125,000. Iron founding, brewing, and brickmaking are carried on, but agricultural produce forms the staple of the trade of Warwick. Pop. (1891) 11,905. Tradition-

ally connected with King Cymbeline, its reputed founder in A. D. 1, and with Guy of Warwick, the vanquisher of the giant Colbrand, Warwick figures in "Domesday" with 261 houses, having earlier been sacked by Danes, but restored by Ethelfleda, Ælfred's daughter, in 914. William of Newburgh, a follower of the Conqueror, replaced her fortress by the castle, which Stephen surrendered to Prince Henry (1153), which was Edward IV.'s prison (1469), and which has been visited by many of England's kings. See Hawthorne's "Our Old Home."

**Warwick, Richard Neville, Earl of,** "the king-maker,' born about 1420; the eldest son of the Earl of Salisbury, and by his marriage with the heiress of the Beauchamps himself became Earl of Warwick (1449). In the Yorkist victory of St. Albans (1455), the opening action of the Wars of the Roses, he fought on the winning side, and three years later sharing in the reconciliation between the hostile parties, was appointed lord-deputy of Calais and admiral of the fleet. As such he gained a splendid success over the Spaniards, but a quarrel between his followers and the king's led to charges of his disloyalty, which he justified by taking the field at Ludlow with his cousin the Duke of York (1459). On the failure of that attempt he again with the Earls of Salisbury and March withdrew to Calais, a town devoted to his cause, and thence in the following summer recrossed to Kent, and, mastering London and capturing Henry VI. at Northampton, brought about the compromise by which Henry was to reign for life but acknowledging York for his successor.

Margaret of Anjou would not thus tamely surrender the rights of her son, and first routing and slaying York and Salisbury at Wakefield advanced to St. Albans, where a second battle ended in Warwick's defeat. Warwick, however, joined the young Earl of March (now Duke of York), and striking with him boldly on London, placed him on the throne as Edward IV., then chasing the Lancastrians back to Yorkshire, almost annihilated them on the bloody field of Towton, March 29, 1461. Possessed of immense domains and princely wealth, with one brother rewarded for his crowning victory at Hexham by the earldom of Northumberland, another made Primate and Lord Chancellor, Warwick indeed seemed able now, in Shakespeare's words, "to do and undo, as him pleased best." Edward's marriage, however, to Elizabeth Woodville pleased him not, especially as he was then negotiating for the king's alliance to Bona of Savoy; neither did the marriage of Edward's sister to Charles of Burgundy, the earl's great foe. In retaliation Warwick bestowed his daughter on the Duke of Clarence, and after seizing on Edward's person, executing the queen's father and brother, and seeming to accept a pardon, involved himself in the insurrection of Sir Robert Welles (1470) for making Clarence king.

Its failure drove him once more to France, where, through the mediation of Louis XI., Warwick engaged to restore the crown to Henry VI., and Margaret to wed her son to Warwick's daughter Anne. His landing in Devonshire came like a thunderclap to Edward IV., who from the North, where he was busy quelling a revolt, escaped to Burgundy, leaving Warwick master of the kingdom. The triumph was brief, for when Edward returned in six months' time, Warwick found himself treated as he had treated others, and after fruitless overtures for a fresh desertion, he with his brother was routed and slain at Barnet, April 14, 1471.

**Warwickite** (after Warwick, Orange co., N. Y., where it is said to have been found), a mineral occurring in slender rhombic prisms in granular limestone, near Edenville, N. Y.; hardness, 3.4; sp. gr., 3.19–3.43; luster, somewhat metallic to vitreous; color, dark-brown, with a copper-red tint; streak, bluish-black; brittle; composition: A borotitanate of magnesia and iron.

**Wash,** a wide estuary on the E. coast of England; between the counties of Lincoln and Norfolk; 22 miles in length and 15 in average breadth. It is surrounded by low and marshy shores, and receives the Witham, Welland, Ouse, Nen, and Nar rivers. The estuary for the most part is occupied by sandbanks, dry at low water, and between these sandbanks are the channels through which those rivers flow into the North Sea. On both sides of the channel by which the Ouse falls into the sea considerable tracts of land have been reclaimed. Anchorage is afforded to vessels by two wide spaces or pools of water, called respectively Lynn Deeps, opposite the Norfolk, and Boston Deeps, off the Lincoln coast.

**Wash Bottle,** an apparatus of great utility in analytical chemistry, used for delivering a fine jet or stream of liquid on to a precipitate for the purpose of washing it, or for removing any residue of a solution or solid particles from one vessel to another. It consists of a flask of hard glass, fitted with a cork or india-rubber stopper perforated in two places. Through each perforation is passed a piece of bent glass tubing, one being carried to within half an inch of the bottom of the flask, and the portion of tubing outside drawn to a fine open point. The other tube is carried just within the bottle, and it is to the outer end of this that the lips are applied in blowing into the apparatus in order to expel the liquid contained in it, water, alcohol, or ether, as the case may be.

**Washburn, Charles Ames,** an American editor, historian, and novelist; born in Livermore, Me., March 16, 1822. He was editor and proprietor of the "Alta California," and the San Francisco "Daily Times" (1858–1861); minister to Paraguay (1861–1865), residing in that country also from 1866 to 1868. He wrote "History of Paraguay" (2 vols. 1871); the novels "Philip Thaxter" (1861); "Gomery of Montgomery" (1865); etc. He died in New York, Jan. 26, 1889.

**Washburn, George,** an American educator; born in Middleboro, Mass., March 1, 1833; was graduated at Amherst College in 1855, and at Andover Theological Seminary in 1859; became Professor of Philosophy in Robert College, Constantinople, in 1868; acting president in 1870-1877, president in 1878-1903; lecturer at Lowell Institute, Boston, from 1909. He was an authority on the politics of Southeastern Europe. During the World's Parliament of Religions in Chicago, in 1893, he delivered an address on Mohammedanism. He contributed many articles to English and American periodicals.

**Washburn, William Drew,** an American manufacturer; born in Livermore, Me., Jan. 14, 1831; was graduated at Bowdoin College in 1854; studied law and began practice in Minnesota in 1857. He later acquired large interests in the lumber and flour industries; was a partner for many years in the Washburn and Crosby flouring mills, and afterward became a director in the Pittsburg-Washburn Company, which had a daily capacity of 22,000 barrels. He was the projector and for many years the president of the Minneapolis and St. Louis railroad; was also the builder of the Minneapolis, St. Paul, and Sault Ste. Marie railroad, of which he remained president till 1889; held a seat in Congress in 1879–1885; and was a United States Senator from Minnesota in 1889–1895.

**Washburn, College,** a coeducational institution in Topeka, Kan.; founded in 1865 under the auspices of the Congregational Church; has productive funds exceeding $175,000; grounds and buildings valued at over $350,000; scientific apparatus, etc., $65,000; volumes in the library, about 16,000; average number of faculty, 100; average students, 800; graduates, over 750.

**Washburne, Elihu Benjamin,** an American statesman; born in Livermore, Me., Sept. 23, 1816. He early tried journalism, but abandoned it to study law at Harvard; was admitted to the bar in 1840 and began practice in Galena, Ill. He was elected to Congress in 1852 and held office till 1869, when he was appointed Secretary of State by President Grant, and soon after minister plenipotentiary to France. During the Franco-Prussian War he made the American legation the refuge of Germans and other foreigners who could not leave Paris. For this service he received special honors from the Emperor of Germany and Bismarck, as well as from the French leaders, Gambetta and Thiers. In 1887 he published "Recollections of a Minister to France." After he returned to the United States he resided in Chicago, where he died Oct. 22, 1887.

**Washburn, William Tucker,** an American novelist and versifier; born in New York, in 1841; was educated at Amherst; became a lawyer. He wrote: "Fair Harvard," the recognized college song of Harvard University; "The Unknown City: A Story of New York; and "Spring and Summer," a volume of verse.

**Washing Machines,** a machine for cleansing linen, clothes, etc., with water and soap. There are numerous varieties, the general feature of all being that the clothes are agitated by artificial means in a vessel containing water, soap, etc. One of the simplest kinds is the dolly, a wooden disk with three or more projecting arms placed horizontally on an upright shaft in a tub. The shaft is fixed in a step at the bottom and passes through a cross piece at the top, and is turned either by a cross handle or by simple spur gear. The arms are moved round backward and forward among the clothes. Nearly all domestic washing machines consist of a tub or cistern of a form which suits the nature of the moving parts of the apparatus. Some operate by squeezing the clothes between grooved rollers, others by rubbing them between corrugated surfaces by a rocking or up and down motion, others again have a combined squeezing and rubbing action, while some are made on the principle of the old dash-wheel used in bleaching and dye works. Some recent washing machines, which have been a good deal used, consist of a ribbed drum or cage formed of tubes fixed into the ends of the drum. The clothes are placed inside the cage, which is kept revolving in opposite ways by turns inside a thin metal case, the hot soapy water circulating freely between the tubes.

**Washington,** a State in the Western Division of the North American Union; bounded by British Columbia, Idaho, Oregon, Puget Sound, and the Pacific Ocean; admitted to the Union, Nov. 11, 1889; capital, Olympia; number of counties, 36; area, 66,880 square miles; pop. (1890) 349,390; (1900) 518,103; (1910) 1,141,990.

*Topography.*— The surface of the State is exceedingly rugged, being traversed from N. to S. by the great range of the Cascade Mountains about 100 miles from the coast. The highest peaks, all extinct volcanoes,

are Mount Rainier, 14,444 feet; Mount Baker, 10,827 feet; Mount St. Helena, 9,750 feet; and Mount Adams, 9,000 feet. Eastern Washington, lying between the Cascades and the Columbia river, includes the Yakima and Kittitas valleys, and is watered by the Columbia river and its tributaries; the Yakima, Snake, Spokane, Methow, and Okanogan rivers. Lake Chelan, in the center of the State, is 70 miles in length, and 3 miles wide. Western Washington has an abrupt slope to tide water, and contains a few fertile prairies and much broken mountain land. It contains Puget Sound Basin, Shoolwater Bay, and the Lower Columbia valley. Puget Sound extends inland about 80 miles and contains many excellent harbors. The Pacific coast has numerous prominent headlands, including Capes Disappointment, and Flattery. The principal rivers of Western Washington are Des Chutes, Puyallup, Duwamish, White, Black, Cedar, Lummi, Skagit, Swinamish, Skokomish, and Snohomish.

*Geology.*— The Cambrian, Silurian, Eozoic, Tertiary, and Cretaceous periods are all represented in the mountains of the W. portion of the State. The N. part, the Blue Mountains and the Coast Range are of the Eozoic period, and the central portion is a volcanic formation.

*Mineralogy.*— Washington is called the Pennsylvania of the Pacific on account of its mineral wealth, especially in coal, in the Puget Sound basin. Gold is found in the Yakima valley, and silver near Spokane. The principal mineral products in 1900 were coal, 2,474,093 short tons, valued at $4,700,068; coke, 33,387 short tons, valued at $160,165; mineral waters, 62,500 gallons, valued at $8,200; gold, 34,743 fine ounces, valued at $718,200; silver, 224,500 fine ounces, valued at $139,190; granite, $48,900; sandstone, $68,133; marble, $11,836; limestone, $249,163; and clay products, $591,277.

*Agriculture.*— The river valleys and plains of Eastern Washington have under scientific irrigation become exceedingly fertile and productive. Stock raising and dairy farming are becoming important industries. The principal farm crops in 1900 were corn, 106,140 bushels, valued at $1,067,943; wheat, 25,096,661 bushels, valued at $12,799,297; oats, 3,016,226 bushels, valued at $1,206,490; barley, 1,386,267 bushels, valued at $540,644; rye, 39,169 bushels, valued at $22,718; potatoes, 1,839,644 bushels, valued at $864,633; and hay, 846,491 tons, valued at $8,041,664.

*Manufactures.*— According to the United States census of 1900, the State had 3,631 manufacturing establishments, employing $52,649,760 capital and 36,048 persons; paying $21,360,897 for wages and $49,099,182 for materials; and having an aggregate output valued at $86,795,051. The principal manufactures, according to values of output, are lumber and timber ($30,286,280); flour and grist ($6,875,672); canned fish ($4,831,038); foundry and machine shop products ($2,257,643); shipbuilding ($1,505,649); railroad cars ($1,479,680); and malt liquors ($1,230,525).

*Commerce.*—The imports of merchandise at the port of Puget Sound for the year 1900 aggregated in value $5,686,256; and the exports, $19,612,077. The imports of gold amounted to $4,441,062; silver, $630,822; exports, gold, $32,374; silver, $1,161,843.

*Banking.*— On Oct. 31, 1901, there were reported 31 National banks in operation, having $3,305,000 in capital, $1,407,693 in outstanding circulation, and $1,251,300 in United States bonds. There were also 31 State banks, with $1,497,300 capital, and $25,249 surplus; and 4 private banks, with $265,000 capital, and $14,209 surplus. The exchanges at the United States clearing houses at Tacoma, Seattle, and Spokane, for the year ending Sept. 30, 1901, agggregated $246,336,662; an increase over those of the preceding year of $7,049,341.

*Education.*— At the end of the school year 1898–1899, the children of school age numbered 108,660; the enrollment in public schools, 97,916; and average daily attendance, 64,192. There were 1,941 public school buildings, public school property valued at $4,977,679; and 3,321 teachers. For higher education there were 36 public high schools, 13 private secondary schools, 2 public normal schools, and 8 universities and colleges for men and for both sexes. The principal colleges include Gonzaga College, at Spokane; University of Washington, at Seattle; Puget Sound University, at Tacoma; and St. James's College, at Vancouver.

*Churches.*— The strongest denominations in the State are the Roman Catholic; Methodist Episcopal; Disciples of Christ; Regular Baptist; Presbyterian; Congregational; Protestant Episcopal; Lutheran; Independent Synods; and United Brethren. In 1899 there were reported 882 Evangelical Sunday-schools, with 7,000 officers and teachers, and 53,000 scholars.

*Postoffices and Periodicals.*— On Jan. 1, 1901, there were 850 postoffices of all grades; and 226 periodicals, of which 16 were daily, 2 tri-weekly, 1 semi-weekly, 174 weekly, 2 bi-weekly, 1 semi-monthly, 28 monthly, and 2 quarterly.

*Railroads.*— The total length of railroads within the State on Jan. 1, 1901, was 2,960 miles, of which 75 miles were constructed during the previous year.

*Finances.*— The total bonded debt on Jan. 15, 1901, was $155,000, not including the $760,000 bonds issued for investment of the

Washington

permanent school fund; and the floating debt was $605,926. There was cash in the general fund amounting to $108,842. The assessed valuation, equalized by the State board, for 1900, of real estate, was, $177,822,995; personal property, $38,721,872; railroads, $21,038,256; total, $237,583,123; tax rate, $6.00 per $1,000, including $3.80 for school purposes.

*State Government.*— The governor is elected for a term of four years, and receives a salary of $4,000 per annum. Legislative sessions are held biennially and are limited in length to 60 days each. The Legislature has 34 members in the Senate and 80 in the House, each of whom receives $5.00 per day and mileage. There is one Representative in Congress. The State government in 1902 was Republican.

*History.*— For the early history of this region, see OREGON. Washington was a part of Oregon Territory till the admission of Oregon, in 1853, when this section was separately organized as Washington Territory. There was subsequently considerable trouble with the Indians. Immigration having set actively in that direction, it was admitted into the Union as a State, Nov. 11, 1889.

**Washington,** a city, and the capital of the United States of America; in the District of Columbia; at the confluence of the Potomac and the Anacostia, or East Branch, rivers, and on the Pennsylvania, the Baltimore and Ohio, the Southern, the Chesapeake and Ohio, and the Richmond, Fredericksburg, and Potomac railroads; 136 miles S. W. of Philadelphia; 226 S. W. of New York; 40 miles S. W. of Baltimore, and 185 miles W. of the Atlantic Ocean. The site of the city is an admirable one, surrounded by a circle of hills and comprising a rolling plain, with here and there irregular eminences which provide beautiful and advantageous positions for the various public buildings. The city was laid out expressly for the National Capital and on a scale indicating that it was expected to grow into a vast metropolis; area, 69¼ square miles; pop. (1890) 230,392; (1900) 278,718; (1910) 331,069.

*Municipal Improvements.*— The United States and the District of Columbia own an extensive waterworks system, costing $10,000,000. The reservoirs have a storage capacity of 76,000,000 gallons, and the water is distributed through 381 miles of mains. The consumption averages 55,000,000 gallons a day. There are in all 320 miles of streets, of which 266 miles are paved. The streets of Washington are irregularly laid out, being from 70 to 160 feet wide. Pennsylvania Avenue is the principal street of the city, having on or near it many of the leading hotels, theaters, stores, etc. F street is the next business street in importance. The sewer system covers 418 miles. The streets are lighted by gas and electricity at an annual cost of about $250,000. The average cost of the police department exceeds $743,500 per annum, and that of the fire department $185,000. The annual cost for the maintenance of the city government is over $9,052,000. The annual death rate averages 21.82 per 1,000.

*Notable Buildings.*— The city contains many magnificent structures. The CAPITOL (*q. v.* for dimensions and history), crowning Capitol Hill and costing $13,000,000, is one of the most beautiful public edifices in the world. It is built in pure Classic style, with two immense wings of white marble, extending from a central structure constructed of light yellow freestone painted white. The main front facing E. is beautified with three splendid porticoes adorned by Corinthian pillars. The central portico contains noted groups of statuary, and on the esplanade immediately in front stands Greenough's famous colossal statue of Washington. The entrance to the rotunda is by the celebrated bronze door, designed by Randolph Rogers and made by Von Müller in Munich. It is 17 feet high by 9 feet wide, and cost $28,000. The relief work on the door commemorates the discovery of America by Columbus. The walls of the interior of the rotunda, which is 180 feet high and 96 feet in diameter, are ornamented with eight panels containing paintings of scenes in American history; while in a space 9 feet wide encircling the hall at a height of 107 feet there is a series of relief illustrations, also of American history. Above the rotunda is built the famous dome, which is 96 feet in diameter and 220 feet from the floor at its highest point. The exterior of the dome is 135½ feet in diameter, 241 feet above the main buildings, and 307½ feet from the ground. A spiral flight of stairs between the inner and outer walls leads to the gallery of the dome, which affords an excellent view of the fresco paintings overhead. The cupola on the top of the dome is 17 feet in diameter and 52 feet high and is surmounted by a ball on which stands a bronze statue of "Liberty" 19½ feet high, by Crawford. The next most impressive feature of the Capitol is the National Statuary Hall, formerly the Old Hall of the Representatives. In form it is semi-circular, and contains 24 columns. The ceiling is 57 feet high at the apex and the length of the room is 96 feet. Here are statues of the two most eminent men from each State in the Union. The Hall of Representatives in the S. wing is said to be the finest legislative chamber in the world. It is 36 feet high and 139 feet long by 93 feet wide. It contains galleries with 1,500 seats for spectators, and desks for members (386 in 1903). The Senate chamber is 113 feet

long by 81 feet wide. It also contains galleries accommodating 1,000 visitors, and desks for 90 Senators. Both of these chambers are tastefully decorated and are splendid specimens of architecture. The Capitol also contains the Vice-President's room, various committee chambers, etc. The grounds surrounding the Capitol comprise about 50 acres, and are divided into the East and West grounds. They form a beautiful specimen of landscape gardening and are adorned with numerous pieces of statuary and many fountains.

The Capitol will in the near future receive the most extensive addition which has ever been made to it. This statement is especially significant from the fact that the entire history of the building has comprised a series of additions to a nucleus of rather meager proportions. The present project dates from the spring of 1901, when the architect of the Capitol was directed by act of Congress to prepare plans for the extension of the central portion of the Capitol, for the renovation and decoration of the rotunda and for the erection on ground adjacent to the Capitol of a fireproof building for office, storage and power-plant purposes.

Presumably no architect would have the temerity to suggest any radical change in the structure of the Capitol; but in the interest of adherence to the present style, it is particularly fortunate that plans for an enlargement such as is now contemplated were handed down to the present architect of the Capitol from his distinguished predecessor, the late Thomas U. Walter, architect and engineer, perhaps best known to fame as the creator of the great white dome of the Capitol and the marble wings now occupied by the Senate and House of Representatives, respectively. No only was the enlargement of the Capitol provided for in the plans prepared years ago, but the extension soon to be undertaken will in reality but carry out the original conception of an enlarged Capitol as evolved by Architect Walter at the time he planned the Senate and House wings and capped the structure with its stately dome. Moreover, the new portion, instead of appearing incongruous or out of harmony with the present pile, will actually add to the majesty of the effect when it is viewed as a whole.

The old Capitol building, fostered by George Washington and designed by Thornton, was considered to afford, when completed in 1830, ample accommodations for the then existing and probable future needs of the country. However, the tremendous progress of the nation soon rendered imperative the provision of more space. Then came the first extension begun in 1851 and completed in 1859. Congress authorized and Architect Walter carried out the construction of the marble additions at the N. and S.

In this, as in all of his work in connection with the Capitol, the architect adhered faithfully to the spirit of the original; and realizing at the same time that the future might again find the Capitol inadequate in accommodations, he devoted much time to the preparation of plans for an extension to the E. of the present building—an addition which would harmonize with what already existed, and also give additional beauty to the splendid dome which he designed and erected, and which he hoped would one day grace a completed structure. The most eminent architects have agreed that in meeting present exigencies it would be unwise to alter the original plan in any particular as concerns the exterior proportions and alignments. The construction of the addition contemplated will cost approximately $2,500,000, and while it involves the removal of the old portico at the E., it does not involve the removal of the principal walls of the old and historical portion of the Capitol. The present front wall of the old building remains as the rear wall of an open court which lights the W. side of the proposed addition.

It is difficult for even the persons thoroughly familiar with the building to appreciate what an enormous addition will be made to the capacity of the structure by this new construction. The area will be increased in the aggregate from 132,730 square feet to 184,120 square feet, an increase of 51,390 square feet, or 38 per cent. Otherwise expressed, the increase of the capacity of the building amounts to 1,854,400 cubic feet, of which amount 1,068,000 cubic feet are provided in the new E. front, or in other words, the addition to be built E. from the central portion of the building as at present constituted. It may seem well-nigh incredible that there is available space for such an addition as is proposed with so slight a departure from the present perspective. As a matter of fact, however, the central flight of marble steps on the E. front, leading to the portico of the rotunda, is indented 20 feet within the line of the two marble wings. Not only will all the space of this indentation be occupied by the addition, but it will project about 15 feet beyond the line of the wings, thus eliminating all suggestion of a rambling appearance in the building considered as a whole, as weli as any suspicion of the undue size of the dome.

WASHINGTON
SCALE OF MILES
0 10 20 30 40
State Capital
County Seats
Indian Reservation Boundaries
Places of 25,000 and over SEATTLE
" " 10,000 to 25,000 Walla Walla
" " 5,000 to 10,000 Everett
" " 2,000 to 5,000 Republic
A B C D
124° 123° 122° 121°
49° 48° 47° 46°
1 2 3 4
Longitude
DOMINION OF BRIT
New Westminster
LULU I.
Boundary Bay
Pt. Roberts
Strait of Georgia
VANCOUVER ISLAND
Victoria
INTERNATIONAL BOUNDARY
Strait of Juan de Fuca
PACIFIC OCEAN
WHATCOM
Blaine
Lynden
Clearbrook
Vanburen
Sumas
Everson
Nooksack
Maple Falls
Excelsior
Hermann
Mt. Hozomeen
Custer
Enterprise
Ferndale
Mountainview
Strandell
Goshen
Wahl
Vanwick
Vanzandt
Lawrence
Deming
Kendall
Warnick
Glacier
Mt. Shuksan
Mt. Baker
Bellingham
Bellingham Bay
Silverbeach
Towanita
Clipper
Fairhaven
Yukon
Acme
Blue Canyon
Alger
Wickersham
Baker Lake
SAN JUAN
Waldron
Prevost
Roche Harbor
SAN JUAN I.
Friday Harbor
Argyle
Eastsound
ORCAS I.
SHAW I.
Thatcher
LOPEZ
Richardson
Urban
Cypress
Guemes
Anacortes
FIDALGO I.
Fidalgo
Beach
LUMMI I.
Padilla Bay
Samish Bay
SKAGIT
Desmond
Prairie
Thornwood
Cokedale
Bow
Belfast
Sedro Woolley
Belleville
Burlington
Lyman
Hamilton
Birdsview Sta.
Baker
Van Horn
Mt. Sauk
Marblemount
Boston Pk.
Cokedale Jc.
Birdsview
Sauk
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Darrington
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Norman
Silvana
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Elwha
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Center
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Pt. Gamble
Quilcene
Bogachiel
Hoh Head
Pins
Hoh R.
L.H. DESTRUCTION I.
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Queets
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Quiniault
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KITSAP
Vinland
Breidablik
Poulsbo
Bartow
Bangor
Pt. Madison
Seabold
Silverdale
Pt. Blakeley
Brinnon
Duckabush
Seabeck
Nellita
Holly
Port Orchard
Harper
Dewatto
Clifton
Reedville
Burley
Burton
Eldon
Hoodsport
Potlatch
Allyn
Hood Canal
Darop B.
Dabob B.
KING
SEATTLE
W. Seattle
Kennydale
Van Asselt
Ballard
Richmond
Bothell
Woodinville
Willows
Kirkland
Redmond
Keith
Northrup
Tolt R.
Halford
Berlin
Skykomish
Inglewood
Monohan
Issaquah
Fall City Sta.
Snoqualmie
Northbend
Newcastle
Preston
Black River
Renton
Elliott
Taylor
Herriston
Sallal
Orillia
O'Brien
Cedar Mtn.
Kent
Maple valley
Barneston
Cedar Lake
Ravensdale
Kanaskat
Palmer Jc.
Danville
Pialschie
Cristopher
Auburn
Kitchelos L.
L. Kaehees
Coal Cr.
Eagle Gorge
Canton
Stampede
STAMPEDE TUNNEL
Martin
Easton
Maywood
Lester
Hot Sprs.
Nelson
Natches Pass
KITTITAS
MASON
Union
Harstine Id.
Grant
Ballow
Detroit
Springfield
Lake Bay
Satsop
Windsor
Matlock
Shelton
Arcadia
New Kamilche
Simpson
Kamilche
Grove
Juno
Summit
CHEHALIS
Moclips
Pacific
Gordon
Onslow
Tunnel City
Anderson
Copalis
Carleton
Otter
Tulips
Hoquiam
Aberdeen
Aberdeen Jc.
Cosmopolis
Montesano
Satsop
Whites
Elma
Malone
Grays Harbor
Damon
Pt. Brown
Pt. Hanson
Westport
Markham
Ocosta
Artic
Cedarville Sta.
Porter
Canto
Vesta
Oakville
TACOMA
S. Tacoma
Dieringer
Puyallup
Bismarck
Sumner
Alderton
Lakeview
Meeker
Murray
Midland
Cascade Jc.
Buckley
Enumclaw
Franklin
Cumberland
Black Diamond
Covington Sta.
Green Water R.
Burnett
Pittsburg
Wilkeson
Carbonado
Milton
Orting
McMillan
Nelson
Crocker
Clover Cr.
Kirby
Graham
Doty
Tanwax L.
Babbler
Morgan L.
Puyallup R.
Metmont
Fairfax
Sherlock
Hillhurst
Olympia
Tumwater
Belmore
Lacey
Littlerock
Bush
Plumb
Yelm
Roy
PIERCE
Kapowsin
Holz
Lakehead
Ohop
Harts
Eatonville
WASHINGTON NATIONAL PARK
Mt. Rainier 14,519
(Mt. Tacoma)
Mt. Aix
THURSTON
Mima
Gilmore
Tenino
Rainier
McIntosh
Tanwax
Grandmound
Bucoda
Alder
Park Jc.
Ashford
Longmires
Elbe
Mineral
Cowlitz Pass
CASCADE MTS.
Gate
Connie
Rochester
Brooklyn
Gleneden
Centralia
Hurn
Independence
Eagleton
Littell
Adna
Chehalis
Newaukum
Alpha
Ladd
East Cr. Jc.
Watkins
Tilton
Cinebar
Bremer
Webster
Silvercreek
Glen Avon
Morton
Vern
Riffe
Salkum
Sulphur Springs
Randle
Cora
Vance
Kosmos
Swofford
Windom
Wilson
Knab
Toledo
Cowlitz
Ethel
Winlock
Bolstfort
Napavine
Curtis
Ceres
Doyad
Pe Ell
Reynolds
Walville
Frances
LEWIS
YAKIMA
PACIFIC
Northcove
Tokeland
Southbend
Willapa
Willapa Bay
C. Shoalwater
Leadbetter Pt.
Menlo
Holcomb
Lebam
Nemah
McCormick
Wildwood
Sopenah
Littlefalls
Oysterville
Nahcotta
Longbeach
Ilwaco
C. Disappointment
Ft. Canby
McGowan
Chinook
Nasel
Deepriver
Frankfort
Grays River
WAHKIAKUM
Eden
Skamokawa
Cathlamet
Columbia R. Bay
Ft. Stevens
Warrenton
Astoria
Svensen
Knappa
Clifton
Westport
Waterford
Marshland
Quincy
Mayger
Clatsop
Seaside
Nehalem
Nehalem R.
Wilson R.
Tillamook
Forest Grove
Hillsboro
Veronia
Olequa
Lithow
Toutle
Silverlake
Slightly
St. Helen
Castlerock
Tucker
Green R.
COWLITZ
Ostrander
Kelso
Ladu
Eagle Cliff
Stella
Eufaula
Carrollton
Kalama R.
Rainier
Kalama
Goble
Deer Id.
Columbia City
St. Helen
Warren
Scappoose
Holbrook
Linnton
Beatty
PORTLAND
Willamette R.
Spirit Lake
Mt. St. Helens
Mt. Adams
SKAMANIA
Tumtum Mt.
Ariel
Yale
Kerns
Lewis R.
Woodland View
Yacolt
Ridgefield
Roxwell
Knapps
Battleground
CLARKE
Felida
Vancouver Jc.
Brush Prairie
Burberton
Vancouver
Ellsworth
Skye
Fisher
Camas
Washougal
Mt. Pleasant
Cape Horn
P. Butler
Cascades
Stevenson
Carson
Homevalley
Collins
Chenowith
Husum
Underwood
Snowden
Guler
Troutlake
Glenwood
Gilmer
Fulda
KLICKITAT
Wright
Pineflat
White Salmon
Hartland
Lyle
Grand dalles
Wahkiacus
Klickitat
Wyeth
Viento
Nicolai
Hood R.
Bingen
Mosier
The Dalles
Celilo
Cascade Locks
Bonneville
Bridal Veil
Latourell Falls
Corbett
Troutdale
Cleone
OR
Nile
Tampico
Hammond's 8 x 11 Map of Washington
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E
120°
F
119°
G
118°
H
117°
49°
48°
47°
1
2
3
4
CANADA
Christina Lake
Grand Forks
Keremeos
Chopoka
Osoyoos L.
Rossland
Sayward
Waneta
Phoenix
Midway
Danville
Hurlburt
Grand Forks Jc.
Laurier
Hughes
Rockcut
Velvet
Boundary
Northport
Marble
Sullivan L.
Molson
Circle
Nine Hill
Bolster
Chesaw
Nighthawk
Mt. Hill
Oroville
Kipling
Wind Pass
Mt. Chopaca
Palmer or Haikwil L.
Mt. Bonaparte
Loomis
Wehesville
Bonaparte
Bodie
Newman
Bonaparte L.
Wauconda
Tonasket
Anglin
Curlew
Dulwich Sta. or Orient P.O.
Malo
Pollard
Karamin L.
Barstow
Boyds
Torboy
Republic
Ryan
Bossburg
Evans
Ione
Marcus
Echo
Meyers Falls
Colville Mt.
Kettle Falls
Colville
Clark Fork
Pend d' Oreille
OKANOGAN
Mazama
Milleys L.
Salmon L.
State Pass
Conconully
Synarep
Riverside
Winthrop
Omak
Sawtooth Ridge
Calispel Pk.
Arden
Harvey
Locke
STEVENS
Waterloo
Addy
Chewelah Pk.
Bluecreek
Cusick
Lenora
Dalkena
Maud
Gifford
Chewelah
Calispell
Calispell L.
COLVILLE INDIAN RESERVATION
FERRY
Meteor
Twisp
Silver
Alma
Okanogan
Lookout Mt.
Malott
Omak L.
Olema
Libby
Moore
Salt L.
Rat L.
Ophir
Knowlton
Methow
Brewster
Nespelem
Lake Chelan
Chelan Range
Bissell
Valley
Cedonia
Hunters
Grays
Fruitland
Springdale
Gerome
Deertrail
Loon L.
Loonlake
Camden
Westbranch
Elk
Priest R.
Newport
Penrith
Scotia
Pateros
Gordon
Barry
Keller
Columbia River
San Poil R.
SPOKAN INDIAN RESERVATION
Clayton
Eloika L.
Milan
Mt. Carlton
Deerpark
Chattaroy
Wellpinit
Tumtum
Hazard
Dragoon
Pratt
Colbert
Lott
Miles
Clark
Hellgate
Plum
Bridgeport
Steamboat Rock
Dyer
Bonita
Howard
Buckingham
Leahy
Lincoln
Tipso
Hesseltine
Sherman
Peach
Egypt
Curby
Dartford
Morse
Newman L.
CHELAN
Chelan
Baldy Mt.
Lakeside
Chelan Falls
Yuba
Brief
Wilbur
Creston
Larene
Crescent
Highland
Mead
Hillyard
Trent
Otis
Hauser
Govan
Mold
Toler
St. Andrews
Coulee
Almira
Mondovi
Reardan
Lyons
Fellows
Davenport
Dennys
Deepcreek
SPOKANE
Spokane Bridge
Postfalls
Carders
Phoenix
Chester
Farris
Entiat
Waterville
DOUGLAS
Hartline
Coulee Jc.
Coulee City
Douglas
Farmer
Baird
Leavenworth
Peshastin
Riverview
Badger Mts.
Moses Coulee
Grand Coulee
Fresh L.
Bright
Rocklyn
LINCOLN
Waukon
Espanola
Medical Lake
Marshall
Moran
Evergreen
E. Spokane
Mica
Earl
Bluestem
Lockwood
Cashmere
Monitor
Wenatchee
Southside
Alkali L.
Stratford
Wilsoncreek
Harrington
Edwall
Cheney
Freeman
Mounthope
Rockford
Midway
Spangle
Fairfield
Mobler
Downs
Crabcreek
Vista
Tyler
W. Fairfield
Waverly
Three Devils
Hammond
Adrian
Krupp
Lamona
Kline
Plaza
Malaga
Ephrata
Trinidad
Winchester
Odessa
Concord
Sprague
North Pine
Spring Valley Jc.
Latah
Quiney
Griffith
Keystone
Colville L.
Alki
Rosalia
Tekoa
Liberty
Tabor
Willis
Moore
Wheatland or Tokio
Rock L.
Pine City
McCoys
Seltice
Menno
Ritzville
Sunset
Oakesdale
Fletcher
Thornton
Farmington
Moses L.
Wheeler
Weber
Essig
St. John
Belmont
Steptoe Butte
Walters
Garfield
Petersburg
Paha
Willada Sta. or Huntley P.O.
Elberton
Ruby
Newland
Akron
Lind
Leon
Winona
WHITMAN
Cedar Cr.
Palouse
Thrall
ADAMS
Providence
Bemis
Endicott
Lee
Diamond
Mockonema
Colfax
Crest
Fallon
Whelan
Beatrice
Billington
Cuningham
Delight
Fletcher
Washtucna
Lacrosse
Wilcox
Garrison
Yakima R.
Roza
Hatton
Cow Cr.
Pampa
Meeker
Almota
Pullman
Sunshine
Moscow
Sentinel Bluffs
Saddle Mts.
Hooper
Penewawa
Snake R.
Staley
Emery
Chambers
Selah
Wenas
Connell
FRANKLIN
Canyon
Hay
Ping
Ilia
Johnson
North Yakima
Cliff
Mesa
Sulphur
Kahlotus
Gould City
Mayview
Colton
Uniontown
Yakima
Parker Sta.
Yale
Moore
Perry
Grange City Jc.
Riparia
Starbuck
Chard
Zumwalt
Pataha City
Valentine
Wapato
Rattlesnake Hills
Eltopia
Scott
Reeser
Pleasant View
Relief
Marengo
Pomeroy
Alpowa
YAKIMA
Simmons
Walker
Clyde
Pickard
Alto
Turner
Whetstone
Covello
GARFIELD
Silcott
Clarkston
Asotin
Toppenish
Zillah
Granger
Outlook
Sunnyside Jc.
Sunnyside
Alfalfa
Sagemoor
Glade
Elwood
Lee
Eureka
Menoken
COLUMBIA
Dayton
Cloverland
Lake
Dodd
Lewiston
Page Sta.
Snake R.
Prescott
Grand View
Chandler
Satus
Belma
Kiona
Relief
Pasco
Adkins
Lamar
Bolles Jc.
Huntsville
Longs
Waitsburg
Peola
ASOTIN
Theon
Empire
Mabton
Gibbon
Prosser
Badger
Erie
Kennewick
Humorist
Climax
Berryman
WALLA WALLA
Cappel
Summit
Blue Mountains
Anatone
YAKIMA INDIAN RESERVATION
Byron
BENTON
Horse Heaven
Hunts Jc.
Rulo
Valley Gr.
Dixie
Gross
Craige
Zindel
Dry Cr.
F. Evans
Dudley Jc.
Touchet
Wallula
Waterloo
Tracy
Hanson Ferry
Bluelight
Whitman
College Place
Walla Walla
Bly
Teller
Cleveland
Bickleton
Paterson
Expansion
Columbia River
Killian
Freewater
Milton
Paradise
Jersey
KLICKITAT
Kuhn
Dot
Huit
Irrigon
Umatilla R.
Grande Ronde R.
Joseph Cr.
Pleasant
Fuhrman
Castle Rock
Athena
Heppner Jc.
Butler Cr.
Arlington
Umatilla
Pendleton
Bingham Sps.
Blalock
OREGON
Elgin
IDAHO
E from 120° Greenwich F 119° G 118° H

Washington

In the interest of the maintenance of absolute harmony, the extended front will be faced with a magnificent portico of fluted Corinthian columns, so elaborate and superior in general contour and size as to unmistakably dominate the porticoes of the wings. In short, the new construction will not only convey an impression of greater depth and compactness in the entire building, but will also provide a larger, broader and consequently more imposing base for the massive dome.

The new Congressional Library is built just E. of the Capitol in a square comprising about 10 acres. It is three stories high, 470 feet long by 340 wide, is constructed of white New Hampshire granite in the Italian Renaissance style, and cost $6,347,000. The building contains an octagonal reading room, 100 feet in diameter. There are many magnificently carved marble arches. The library is constructed around four spacious inner courts and in all has over 2,000 windows, which make it the best lighted building of its kind in the world. Besides the reading room, there are a lecture hall, copyright record rooms, a large art gallery, a map room, etc. The whole library could be made to accommodate 6,000,000 volumes. In 1900 it contained nearly 1,000,000 books, exclusive of pamphlets, and the accretions are from 10,000 to 15,000 volumes each year.

The United States Treasury building is 1¼ mile W. of the Capitol. It is constructed of granite in the Ionic style, and cost $6,000,000. It is three stories high and 468 feet long by 264 wide. An Ionic colonnade modeled after the Temple of Minerva in Athens, is built on the E. front. On the W. front is a magnificent central entrance with eight colossal monolithic columns. There are in all about 200 rooms including the cash room, which is finished with rich marble and occupies two stories; the gold room, containing millions of dollars in gold coin; the Redemption Division; counterfeit room, etc. All of the United States notes, bonds, etc., are made here.

The building of the State, War, and Navy Departments is one of the largest public edifices in Washington. It is built of granite in the Roman Doric style, is four stories high, 567 feet long by 342 feet wide, covers 4½ acres, and cost $11,000,000. In the N. and E. wings are the War and Navy Departments; in the S. portion is the State Department. The building contains in all 566 rooms, including the Hall of the Secretary of State, the Ambassador's Room, and the library with 60,000 volumes. In the latter apartment the Declaration of Independence is preserved.

The building of the Patent Office, also known as the Department of the Interior, is located in the central part of the city. It is 453 feet long by 351 feet wide, and is constructed of granite, marble, and freestone, in the Doric style. The main entrance faces F street, and is reached by a broadway stairway of granite steps. The portico has 16 enormous Doric columns supporting a classic pediment. The building contains besides offices and other rooms the model room, in which there are great numbers of models, representing every department of mechanical art. The length of the floor in the latter room is 1,350 feet, or over ¼ of a mile. The offices of the Secretary of the Interior, of the Commissioner of Patents, and of the Indian Bureau are on the second floor.

The building of the Land Office, formerly occupied by the Postoffice Department, and costing $1,700,000, is of white marble in the Italian or modified Corinthian style, and is 300 feet long by 204 feet wide. It is three stories high and on the 8th street side has sculptures illustrating the telegraph and railroad.

The Pension building is constructed in the Renaissance style. It borders on Judiciary square, covers 80,000 square feet, is 75 feet high, and 400 feet long by 200 feet wide. On the exterior and on a level with the second floor is a notable band of sculpture in terra-cotta, 3 feet in height, and, 1,200 feet in length. It represents an army in campaign, supported by sailors and boats of the navy.

The Smithsonian Institution is a magnificent structure, erected of red sandstone in the Romanesque style. It is 477 feet long by 150 feet wide and has 9 towers from 75 to 150 feet in height. It was established by JAMES SMITHSON (*q. v.*). The remaining noteworthy buildings include the Bureau of Education, Department of Agriculture, Army Medical Museum and Library, building of the Commission of Fish and Fisheries, the United States Naval Observatory, Executive Mansion or "White House" (see WHITE HOUSE), a National Soldiers' Home, etc. The buildings of note not belonging to the government include the Corcoran Gallery of Art, the Masonic Temple, Odd Fellows' Hall, "Evening Star" building, the "Baltimore Sun" building, Washington Market, the court house, New Willard, Raleigh, Shoreham, Arlington, and Gordon hotels, and the Cosmos, Army and Navy, Washington, and Metropolitan clubs.

*Monuments.*— These include the Washington Monument, the Naval Monument, in honor of the officers, sailors and marines who were killed in the Civil War, the Lafayette Monument, with statues of Lafayette, Rochambeau, d'Estaing, De Grasse, and Duportail, statues of Washington, Franklin, Webster, two of Lincoln, General Rawlins, Admiral Farragut, Martin Luther, Admiral Dupont, President Garfield, and Chief-Justice Marshall; and equestrian statues of Gen. Winfield Scott, Nathanael

Greene, George H. Thomas, W. S. Hancock, John B. McPherson, and Andrew Jackson.

*Banks.*— On Sept. 30, 1901, there were 11 National banks in operation, having a combined capital of $2,775,000; and a surplus fund of $1,603,460. The exchanges at the United States clearing house in the year ending Sept. 30, 1901, aggregated $138,260,424, an increase over the preceding year of $6,731,523.

*Education.*— The city has 125 buildings used for school purposes. At the close of the school year 1898–1899 the children of school age numbered 72,000; the enrollment in public day schools was 45,560; and the average daily attendance was 31,220. There were 1,191 teachers, and public school property of an estimated value of $5,000,000. The white and negro pupils are provided with separate schools. The institutions for higher education are the Columbian University (Bapt.), Howard University (non-sect.), Gallaudet College (non-sect.), Georgetown University (R. C.), the Catholic University of America, Gonzaga College (R. C.), American University (M. E.), National University Law and Medical Schools.

*Churches and Charitable Institutions.*— There are about 225 churches in Washington, representing all of the principal denominations, and many of the smaller ones. The charitable institutions include the Columbia Institution for the Deaf and Dumb, National Deaf-Mute College (the only college in the world for deaf-mutes), Government Asylum for the Insane, Providence Hospital, National Homœopathic Hospital, Garfield Hospital, Emergency Hospital, Columbia Hospital for Women, the Louise Home, Reform School for Boys, Reform School for Girls, Industrial Home School, Washington Orphan Asylum, House of the Good Shepherd, the Children's Hospital, St. Ann's, St. Vincent's, and St. Joseph's Orphan Asylums, Home for the Aged, etc.

*Finances.*— On July 1, 1878, the duties of the Sinking Fund Commissioners of the District of Columbia were transferred to the Treasurer of the United States. Since that date an annual appropriation has been made by Congress sufficient not only to pay the interest on the outstanding bonds, but also, it is believed sufficient to liquidate the whole debt of the District by 1924, in which year the 3.65 per cent. loan matures. On April 1, 1901, the total funded debt of the city was $15,075,600. In 1900 the assessed valuations were, real estate, $179,351,811; personal property, $11,497,933; total, $191,049,744; tax rate, $15.00 per $1,000.

*History.*— It cost the Federal Congress a long and a bitter wrangle to decide where the capital should be; and the decision was made at last by a political "bargain." Sectional jealousies were strong, and members of Congress from New England and from New York were afraid that those from the South might gain undue advantage over them. So stubborn grew the contest that it was feared the republic, as yet none too strongly welded together, would be shattered before a settlement could be made, and but for the political sagacity of Alexander Hamilton there might have been grave danger.

The Southern members, eagerly seconding Washington's fondly cherished desire, had asked that the seat of the Federal government be established on the banks of the Potomac; and when Congress refused this request their anger had rivaled the anger of the Northern men at the opposition of the South to Federal assumption of State debts incurred during the Revolution. Might it not be, Hamilton asked Jefferson, at a chance meeting in front of the President's house in Philadelphia, that the Southern men would agree to vote for the assumption of the State debts if the Northern men would support a bill for a capital on the Potomac, and would not the Secretary of State exert his good offices to bring about such result? The suggestion came as if on the thought of the moment; but it was so earnestly and eloquently put forward by Hamilton that Jefferson declared that "though a stranger to the whole subject," he would be glad to lend what aid he could. With his powerful aid the assumption bill secured the sanction of Congress.

The site of the present city, covering the lower portion of the district, was selected by Washington in January, 1791, but it had been admired by him many years before. When a boy he saw it while riding the country on horseback, and he spoke of it when as a young man he camped with Braddock on the hill where the naval observatory now stands.

Washington, always more of a merchant and engineer than artist, had thoughts of a great commercial city there, with the navigable Potomac reaching to the sea to help it in the race for supremacy; and it was with more than his usual zeal and hopefulness that in the early spring of 1791 he set about planning the future seat of government. The private owners of the land proved a source of vexation and of some delay. Many of these were the descendants of a little band of Scotch and Irish who had settled on the land 100 years before, and had inherited from their fathers ability to drive a hard bargain.

Aged David Burns, a justice of the peace and a tobacco planter in a small way, proved the most stubborn and greedy of all. Even Washington was at first unable to do anything with "obstinate Mr. Burns," who did not want a capital at his front door, and did not care whether or not

the seat of government came to the banks of the Potomac. Washington argued with him for several days, explaining to him the advantages he was resisting; to all which, so the tradition runs, Burns made reply:

"I suppose you think people here are going to take every grist that comes from you as pure grain; but what would you have been if you had not married the widow Custis?"

Burns at last capitulated, and transferred his 600 acres which he did not wish to see spoiled for a good farm to make a poor capital, on the same terms that had been made with the other owners of the site — the government to have one lot and the original owner one lot alternately, the latter being also paid $125 per acre for such part of his land as might be taken for public use. Burns stipulated that the modest house in which he lived should not be interfered with in the laying out of the city; and since this condition was agreed to by Washington, Burns' cottage stood till a few years ago, one of the historical curiosities of the capital.

After David Burns, the most considerable owners of the land taken for the federal city were Samuel Davidson, Notley Young and David Carroll, the last named one of the three commissioners selected by Washington to have entire charge of the surveying and laying out of the district and the erection of the necessary public buildings. The other commissioners were Thomas Johnson of Maryland and David Stuart of Virginia; and on April 15, 1791, with impressive Masonic ceremony and in the presence of a goodly assemblage, they laid the first boundary stone of the district at Jones' Point, on the Virginia side of the Potomac. Early in the following September, the commissioners decided to call the federal district the Territory of Columbia,— a title changed some years later to the District of Columbia; and the city to be established on the river bank the City of Washington — this without knowledge of the President, but with the common consent of Congress and the people.

Meanwhile, Maj. Pierre Charles L'Enfant had been chosen by Washington to draw the plan of "the new Federal town." L'Enfant, a Frenchman, and a kinsman of D'Estang, was a skillful military engineer who had come to America in April, 1777, in the train of Lafayette. He devoted the spring and summer of 1791 to elaborating his plans for the projected city. One point he quickly settled — he would not plan for 13 States and 3,000,000 of people, but for a republic of 50 States and 500,000,000 people; not for a single century, but for 1,000 years. Dominated by this thought, he builded better and wiser than any one in his lifetime was willing to admit; for the chief men of his day, meagerly educated and reared in the practice of the strictest private economy, were provincial in their ideas of art and government expenditure.

Jefferson was almost the only man then conspicuous in public life who had had the advantages of extensive foreign travel; and even Jefferson wished the city laid out in the regularity of squares, with all the streets intersecting at right angles, as in Philadelphia, and, unfortunately, in most other American cities. L'Enfant made the regular chess-board squares as Jefferson wished, but he put in so many avenues running at acute angles that the monotonous effect was happily destroyed, and the opportunity was presented for making the capital the magnificent city it has since become.

The States of Maryland and Virginia, prompted by the location of the federal capital within their borders, voted $192,000 to the United States to aid in the erection of the projected public buildings; and in March, 1792, soon after the completion of the survey of the city, the commissioners advertised for designs for the Capitol and for "the President's house," offering in each instance a premium of $500 and a building lot to the author of the accepted design. Among the submitted designs for the executive mansion was one by James Hoban, a young architect of Charleston, S. C. This design, which followed that of the palace of the Duke of Leinster in Dublin, being approved, Hoban was awarded the premium, and engaged at a salary of 100 guineas per year to superintend the construction of the mansion, which was soon called the White House.

For the Capitol 16 designs were submitted by as many architects; but all, after careful examination, were counted unworthy of serious consideration. Soon, however, Stephen L. Hallett, a French architect residing in New York, sent to the commissioners a sketch of a design which met with favor, and he was invited to perfect it. Hallett had not completed his labors when Dr. William Thornton, an Englishman who had lately taken up his residence in America, submitted a design to Washington and Jefferson which so pleased them that the President requested its adoption, suggesting that as Thornton had no practical knowledge of architecture, the execution of his design be intrusted to Hallett. Thornton's design thereupon was accepted by the commissioners, and Hallett was appointed supervising architect with a salary of $400 per year. The corner stone of what was to be the N. wing of the Capitol was laid on September 18, 1792, when Washington delivered an oration and the Grand Master of the Maryland Free Masons an appropriate address. "After the ceremony," to quote a contemporary account of the affair, "the assem-

blage retired to an extensive booth, where they enjoyed a barbecue feast."

Ill-timed and unseemly bickerings between architect and commissioner, the opposition of L'Enfant to raising funds by a public sale of lots, and many such difficulties delayed the completion of the N. wing till 1800; but even these were not the only obstacles with which the builders of the federal city were compelled to contend. At the first sale of lots the hurtful rumor was industriously spread that Congress would never remove to the Potomac, but would remain in Philadelphia. In 1792 Washington wrote to the commissioners that unless greater activity prevailed, their whole previous labor might be lost; and later he was obliged to make residence on the spot compulsory with them. Most serious and embarrassing of all was the ever present need of money. It had been hoped that before the sums subscribed by Virginia and Maryland were expended, the sales of lots would supply the balance needed to complete the public buildings. This expectation was only partly realized, — many of the early contracts for the sale of lots were afterward repudiated, — and before the walls of the Capitol and the White House had reached the roof line, the commissioners were obliged in 1796 to ask Congress for an appropriation of money. Congress responded to this request by authorizing the commissioners to negotiate a loan of $300,000. This loan was guaranteed by the government, but the money was not to be had on the terms proposed. After some delay, the State of Maryland, at Washington's personal request, took two-thirds of the loan, stipulating that the commissioners who were all men of means, should add their individual guarantee to that of Congress — a startling indication of the government's poor credit. In 1798 Congress, again appealed to by the commissioners, voted an appropriation of $100,000, and in the following year the State of Maryland lent them half that sum, requiring, as before, private security for its repayment.

As a result of all these efforts, work on the Capitol and the White House made fair progress, and two other public buildings were begun and pushed to completion. These were erected at the corners of the 20-acre plot set down on L'Enfant's design as "the President's grounds." One, known as the Treasury Department building, occupied a portion of the site of the present Treasury building. The War Office, as the other building was called, occupied the site of the central portion of the present State, War, and Navy building. This latter building, enlarged by the addition of a third story and a wing, was known in later years as the Navy Department building, being removed in 1871 to make room for the new building.



When Washington last beheld the city which bears his name, shortly before his death in 1799, it was a straggling settlement in the woods, almost wholly devoid of streets, with 30 or 40 residences, — most of these small and uncomfortable, — and an unfinished Capitol and President's house. Indeed, Washington long remained a sparsely built, unsightly city and a comfortless place of residence. For more than a generation its growth in population was less than 600 a year, a rate of increase that would now put to shame almost any village in the land; and so late as 1840 De Bacourt, the French minister, could write that Washington was "neither a city, nor a village, nor the country," but "a building-yard placed in a desolate spot, wherein living is unbearable."

All this was changed by the struggle for the Union, which doubled the population of Washington and brought in freedom and Northern enterprise, but more important still, by a thousand moving and glorious associations, endeared the capital to the people of the whole country. Then came its remaking by Shepherd and his associates. Now it is a truly imperial city, and the judgment of Washington and the genius of L'Enfant have been vindicated.

**Washington,** a city and county-seat of Daviess Co., Ind., 20 miles E. of Vincennes; on the Baltimore and Ohio Southwestern and the Evansville and Indianapolis railroads. It is the center of a coal mining district, and is an important shipping point of coal, flour, hogs, cattle, and horses. It has railroad shops, 2 National banks, and daily and weekly newspapers. Pop. (1890) 6,064; (1900) 8,551.

**Washington,** a borough and county-seat of Washington co., Pa.; on Chartiers creek, and on the Waynesboro and Washington, the Pennsylvania, the Pittsburg, Cincinnati, Chicago and St. Louis, and the Baltimore and Ohio railroads; 31 miles S. W. of Pittsburg. It contains WASHINGTON AND JEFFERSON COLLEGE (*q. v.*), the Lemoyne Cremation plant, Female Seminary, numerous churches, court house, public library, Trinity Hall School, National and private banks, and several daily and weekly newspapers. It has carriage shops, broom factory, cigar factories, stove foundries, tanneries, woolen and flour mills, etc., and an assessed property valuation of nearly $5,000,000. Pop. (1890) 7,063; (1900) 7,767; (1910) 18,778.

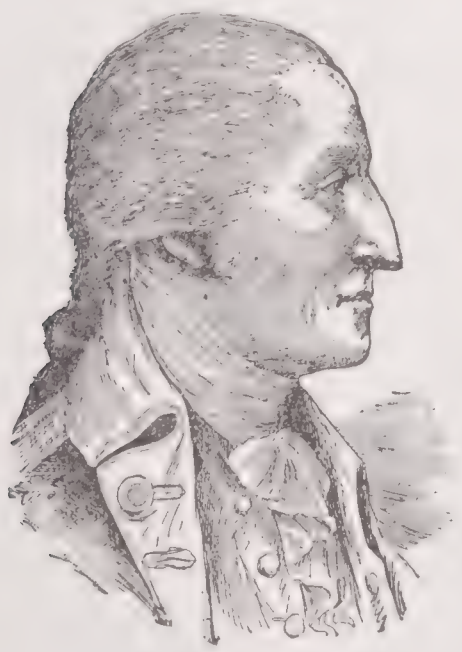
**Washington, University of,** a coeducational non-sectarian institution in Seattle, Wash.; chartered in 1859; opened in 1862; has productive funds exceeding $1,500,000; grounds and buildings valued at over $1,500,-

000; scientific apparatus, etc., $250,000; volumes in the library, about 39,000; average number of faculty, 100; average students, 1,850; graduates, over 1,200.

**Washington, Booker Taliaferro,** an American educator; born a slave in Hale's Ford, Va., about 1859. After the Civil War he removed with his mother to West Virginia, where he worked in the mines, attending school in the winter. In 1875 he was graduated with honors at the Hampton Institute, Va.; was a teacher there till in 1881, when he was elected by the State authorities of Alabama principal of the Tuskegee Normal and Industrial Institute, which he organized and built up. He received the degree of A. M. from Howard University in 1896; was a speaker on educational and racial subjects, and wrote; "Sowing and Reaping" (1900); "Up From Slavery" (1901). Much comment was created in the South by President Roosevelt inviting him to a private dinner at the White House in 1901.

**Washington, Bushrod,** an American jurist; born in Westmoreland co., Va., in 1762; was nephew of George Washington, and became heir to his papers and library; was a member of the Virginia House of Delegates, and of the Virginia ratifying convention in 1788; associate justice of the United States Supreme Court in 1798–1829. He took great interest in the organization of the American Colonization Society, and was appointed its first president. He died in Philadelphia, Pa., in 1829. His nephew, AUGUSTINE WASHINGTON, came into possession of the Washington residence, of Mount Vernon, and died in 1832. He was the author of "Reports of the Court of Appeals, of Virginia."

**Washington, George,** an American statesman, military officer, and 1st President of the United States; born of English stock in Westmoreland co., Va., Feb. 22, 1732. His father died early, but his mother, Mary Ball, gave him an admirable training, which was continued later by his elder half-brother, Augustine. Of actual schooling he had little, save such as sufficed to make him a practical surveyor. He spelt badly, but was able to do accounts well; he wrote poor verses, but was careful to copy out 50 odd "rules of behavior"; he had as little of the true literary afflatus as any youth of genius could well have, but he tamed the wildest horses and dominated the most unruly of his schoolmates. In short, he was a young Virginian Cyrus, riding well, shooting well, and telling the truth. But if it was fortunate for his country that he escaped becoming an epic poet, it was equally fortunate that he gave up the idea of entering the English service as a midshipman on account of a dutiful regard for his mother's wishes. One can contemplate with pleasure the picture he presents as a 16-year-old explorer, surveying the lands of Lord Fairfax amid the wild passes of the Alleghenies. The youth who so bravely fronted all "moving accidents by flood and field," who gained a reputation for sobriety and prudence both with the savage tribes he was forced to encounter and the official circles of Williamsburg, was doing precisely the work best fitted to prepare him for the higher labors of his manhood.



GEORGE WASHINGTON.

He rose rapidly, and in three years was made adjutant-general of militia in one of the border districts. But he was soon called away to accompany his invalid brother Lawrence on a voyage to the West Indies. This was destined to be his only experience of foreign travel; but he was by nature little capable of being tainted by provincialism. Returning to Virginia, he found his military charge renewed, and was given speedy opportunity for active service. He was dispatched by Governor Dinwiddie in the fall of 1753 on a mission to the French invaders of the Ohio region — a dangerous task, which others had declined, but which he accepted with alacrity. He braved the rigor of the season and the peril of the long and almost unknown way, and in about three months' time was back at Williamsburg with the French answer. Neither savages nor treacherous guides, nor ice-gorged rivers could prevail against so bold a heart or so keen an eye; nor could flattery at home undermine a nature so well balanced, a modesty so innate and pure. He was at once put in command of the temporary militia of the colony, and was subsequently made lieutenant-colonel of the augmented forces. His superior officer soon died, however, and he was left in full charge of the expedition to the Ohio. He acquitted himself admirably in the fight at Great Meadows, but was forced to capitulate shortly after, the result being honorable, and on the whole fortunate, considering the rashness of the enterprise.

The death of the French officer Jumonville in a preliminary skirmish led to a curious sort of reputation for the young colonial soldier, the future liberator of America being denounced as an assassin be-

cause of an absurd mistake by which the leader of a scouting party was converted into the bearer of a flag of truce. But while French censure could not hurt Washington, Dinwiddie's conduct with regard to the reorganization of the Virginian troops did; and after a manly remonstrance he resigned, showing in this matter, as well as in his subsequent refusal to submit to be outranked by officers holding royal commissions, that perfectly poised dignity of character for which he is probably more noted than any other great man in history. When Braddock, however, offered Washington a post as aide-de-camp which he could accept with honor, he was glad enough to march against the foe and to tender advice which no man in America was better fitted to give and no commanding officer less likely to profit by. The prudence of Washington as a counselor, as well as his intrepid conduct at Fort Duquesne, taught all discerning observers that he had in him the stuff of which not only good border soldiers but also great generals are made; and one of these observers, the eloquent preacher, Samuel Davies, was wise enough to predict that "that heroic youth, Colonel Washington," would one day render his country some distinguished service. For a time his services were chiefly directed toward securing the safety of the Virginia borders, and he found leisure to make a visit to Boston on military business, as well as to fall in love.

His marriage with the widow, Martha Custis, took place in January, 1759, and those who are wont to accuse Washington of lacking sentiment may be advised to study carefully all that can be learned about the romantic affair. Military life seemed over for him, and he settled down as a gentleman farmer, serving his colony in the House of Burgesses, where he was formally thanked for his exertions in the public behalf, but was too modest to be able to reply; looking after the interests of his parishes in the local vestries, dispensing hospitality in true Virginian style, and superintending his estates in a thrifty fashion peculiarly his own; and last, but not least, keeping up his spirits and his health by frequent indulgence in the manly sport of fox hunting. At the age of 30 he was plainly the greatest soldier in the colonies, the man to whom all eyes would turn should any public danger impend; and if no danger came, he would nevertheless be one of the wealthiest and most prominent citizens of the "Ancient Dominion." He had thus little to wish for except children. But if children did not come, his life was destined to be filled with a higher love and more absorbing cares. He was to be the Father of his Country. From his seat at Mount Vernon, which he had been progressive enough to link with the rest of the world by a private wharf, he watched the clouds gathering in the political heavens, and he showed a statesmanly prescience in being almost the first American to perceive that a complete break with England was necessary to the peace and prosperity of the colonies.



He was no revolutionist, but neither was he afraid to trust the conclusions of his own mind; and if he was no orator, he was at least not the man to mince his words. Cæsar himself did not more thoroughly see the necessity for one-man rule at Rome than Washington saw the necessity for public independence in America. He declared at Williamsburg, in 1774, that he was ready to raise 1,000 men, support them at his own expense, and march them to the relief of Boston. A few weeks later he rode on horseback with Patrick Henry and Edmund Pendleton to attend the 1st Continental Congress in Philadelphia. He was, by the confession of Henry himself, easily the greatest man among the delegates. The 2d Congress saw him again in attendance, and ready to give his life for his country. But though he could brave death he could not face praise, and he left the chamber when John Adams nominated him to be Commander-in-Chief of the Continental forces. The next day he accepted the post, while protesting his own unworthiness and refusing to accept any pay beyond a reimbursement of his expenses. No Roman of old ever came forward to save the State with purer intentions or with more favorable auguries of success. Though to weaker spirits the prospect was appalling, strong men drew happy omens, not from the flight of birds and the entrails of victims, but from the justice of the common cause and the character of Washington. Nor did they mistake, nor do we now mistake, when we assign the success of the Revolution to these two causes.

As one retraces the weary years that elapsed between his taking command (July 3, 1775) and his laying down his office (Dec. 23, 1783), it is perceived clearly that under Providence the issue of the mighty struggle depended on him. Had he lost heart at the supineness and bickerings of the people at large, had he grown weary of correcting the blunders of incapable subordinates, had he disdained to control a fatuous Congress, or to put down a wretched cabal among his own officers, had his nerves given way at the sight of the sufferings at Valley Forge; had his spirit wavered at frequent defeat — in short, had he been anything but the noble patriot and great commander that he was, the course of history might have been changed, and the United States might have died in its birth and forever, or come into existence again years later and under far different auspices. But he was Washington — the noblest figure that any people has ever set in the forefront

Washington

of its life and history. While he lived and fought on with his ragged troops, the Union was maintained in spite of all State squabbles; while he was in command, any alliance made with France must be one which America could accept with dignity; while his brave heart beat, repulse meant only fresh resolve, and hardship and suffering only more splendid rewards of triumph.

It is idle to deny that he was the soul of the Revolution, and it is equally idle to ask whether or not he was a great general. Whether he was, technically speaking, a master of the art of war, students of that art may decide; though it is as well to remind them that Frederick the Great praised his Trenton campaign as a masterpiece of strategy. But that he is worthy to rank with the supreme commanders of history, no man of sound judgment and capable imagination will deny. Not that he always won his battles, or won them in the most approved way; not that he flamed like a comet in the heavens, threatening desolation to the nations; not that he moved across the world's stage like a Karl or a Timor. His career does not enthrall us as does that of Alexander; it has not such tragic elements of inspiration and pathos as has that of Hannibal; it does not leave us breathless with admiration as does that of Cæsar; it does not exalt us and horrify us as does that of Napoleon. But it does give us that supreme sense of satisfaction which flows from the perception of harmony and proportion; it does thrill us with the intense and elevated joy which must ever follow the spectacle of great powers consciously working for the successful accomplishment of divine justice; it does fascinate us by means of those elements of sublimity and pathos that are never absent from the contemplation of a lonely but serene elevation above the common tide of humanity.

Nor are concrete evidences of his greatness as a soldier lacking. We remember the Berserker rashness and daring displayed at Fort Duquesne and at Monmouth, and we recall William the Conqueror at Hastings. We watch him at the crossing of the Delaware and at Valley Forge, and we recall Hannibal on the Alps. We observe him turning a ragged body of suspicious New Englanders into trained soldiers ready to die for him, and we recall no less a man than Cæsar. We see him put down the Conway cabal and reduce Congress to his bidding, and we recall Marlborough. We see him quell Lee with his fiery eye and biting words, and we somehow recall Cromwell. We watch him in his tent, brooding over the treason of Arnold and weighing the claims of mercy and justice in the case of André, and we recall only his own imperial self. Yes, Washington the general is a supremely great man, and those who deny the fact do so because they have not been able to survey his career from the proper point of view. It is hardly an exaggeration to say that to the trained student his greatness is even implicit in his proclamations to his soldiers from first to last.

He was no master of style, but certainly for directness and vigor of phrase, for patriotic purpose, for clear-sighted content, his circular letter to the governors of all the States (June 8, 1783) is unsurpassed among the political documents of the world. His entire correspondence from the time he retired from command of the army till he reëntered the service of his country as its first President, is a monument to his modesty, his magnanimity, his prudence, and his wisdom. Frederick the Great himself, resting from war that he might restore order and peace to the people, is no grander figure than this victorious American general, watching from Mount Vernon the fortunes of his country, and lending the weight of his counsel and his example to the sacred cause of union. He served this cause still further by presiding over the convention in 1787, and 1789 he entered on the presidency of the nation, assuming a new rôle for which he was admirably fitted and in which he was destined to achieve magnificent success.

To many persons Washington the statesman is harder to realize than Washington the general. This is probably a result of political partisanship. Men look back to those two great founders of parties, Jefferson and Hamilton, and forget the chief who dominated and controlled them. Washington really made Hamilton and he always used Jefferson when he needed him; it was thus perhaps in accordance with weak human nature that Hamilton should have been ungrateful to his memory, while Jefferson was impelled to pay him a tribute —noble in spite of its jealous touches. No fact in history is more clearly established than that Washington was the chief figure in his own administrations. He came to the chair of State with the best equipment possible, and he would have left it vacant forever had it been requisite to fill it with a successor who should be his equal. He had not the analytic mind of Hamilton nor the philosophic grasp of Jefferson, but his training for the duties of a statesman had been superior to theirs. He came of a race used to act and to command. From an early age he had to rely on himself, and so he attained to that self discipline which is indispensable to a political leader. Circumstances determined that he should learn the lessons of life from men rather than from books; thus he stood in no danger of becoming a doctrinaire. His early experiences as a surveyor, a backwoodsman, and a soldier gave him a true sympathy with democracy, and hence enabled him to understand the only rational principle on

which a stable government could be founded in America; while his good birth and training, and his position as a planter aristocrat, put him in touch with that English past from which it would have been impossible for the new nation to break entirely. Add to all this the fact that his nature was essentially straightforward and manly, and that he had not a conspicuous weakness, that his mind was clear and flexible, and if not quick, certainly not slow, and we surely have as well equipped a statesman as the world's history can furnish.

Compared with him, how the other figures of the period, even the greatest, shrink and diminish! The spiritual dignity of his altruism sits not on Franklin; his breadth and catholic charity of judgment belong neither to Hamilton nor to Jefferson: and who would think of comparing with him the Madisons, the Jays, the Morrises, the Ameses, the Wilsons of the time, able and patriotic men though they all were? Dignity, steadfastness, uprightness, serenity, benignity, wisdom — these are the characteristics of Washington's statesmanship, whether we regard his firm policy of resistance to the insolence of revolutionary France, or his refusal to plunge his country into a second war with England, or his cordial acceptance of the financial measures of Hamilton, or his steady accentuation of the national principle, or his noble efforts to reconcile his cabinet, or his strong but humane policy toward the Indians, or his prompt crushing of the Whisky Rebellion, or finally, his progressive views on the subjects of slavery and national education, and his prophetic comprehension of the importance of the West. A perfect equipoise of powers which taken separately would not be supreme, appears to be the characteristic mark of his rare variety of genius, which among men of action is illustrated in Alfred the Great, and among men of letters, in Sophocles. It is to this class that Washington belongs — to the class of men whose balance of faculties is so serenely perfect as to constitute genius of perhaps the highest order. What shall we say of such a man, save that he was as great in peace as he was in war; that he was veritably the Father of his Country?

Washington became Commander-in-Chief of the American army on June 15, 1775, and for several years his history was that of the Revolutionary War, elsewhere recorded. Suffice it here to say that he created the American army; fought the English generals, Howe, Clinton, Burgoyne, and Cornwallis, with various results; till, finally, he surrounded Cornwallis at Yorktown, and compelled him to capitulate. To his intrepidity, prudence, and moderation, the United States is almost wholly indebted for the independence which was secured to it by the treaty of peace concluded in 1783. Soon after this event, Washington resigned his commission to Congress, and in his address on that occasion, the magnanimity of the hero was blended with the wisdom of the philosopher. He returned to his seat at Mount Vernon and, like Cincinnatus of old, he returned to his former and favorite pursuits of agriculture. The federation of the States having failed to afford an efficient government, Washington proposed conventions for commercial purposes, which led to the Convention of 1787, of which he was a member, which founded the present Federal Constitution, considered by him as the only security against anarchy and civil war. Under this Constitution he was chosen President, and inaugurated in New York, April 30, 1789. His government was marked by that well-tempered prudence which distinguished all his conduct. Having been reelected as President, he held office till 1797, when he again retired to his estate at Mount Vernon. In 1797, when there arose a difficulty with France, threatening hostilities, he was appointed Lieutenant-General and Commander-in-Chief, a post which he accepted with extreme reluctance, but with that spirit of obedience to the call of duty which had been the governing rule of his life. On Dec. 12, 1799, he was exposed in the saddle, for several hours, to cold and snow, and attacked with acute laryngitis, for which he was repeatedly and largely bled, but sank rapidly, and died, Dec. 14.

Washington was childless, but most happy in his domestic relations. He was mourned even by his enemies, and deserved the record: "First in peace, first in war, and first in the hearts of his countrymen." The following estimate of the character and intellect of the great American patriot is from President Jefferson:

"His mind was great and powerful, without being of the very first order; his penetration strong, though not so acute as that of a Newton, Bacon, or Locke; and, as far as he saw, no judgment was ever sounder. It was slow in operation, being little aided by invention or imagination, but sure in conclusion. Hence the common remark of his officers of the advantages he derived from councils of war, where, hearing all suggestions, he selected whatever was best; and certainly no general ever planned his battles more judiciously; but, if deranged during the course of action, if any member of his plan was disarranged by sudden circumstances, he was slow in readjustment. The consequence was, that he often failed in the field, but rarely against an enemy in station, as at Boston and York. He was incapable of fear, meeting personal danger with the calmest unconcern. Perhaps the strongest feature in his character was prudence, never acting till every circumstance, every consideration, was maturely weighed; refraining, if he saw a doubt; but, when once decided, going through with his purpose, whatever obstacles opposed. His integrity was the most pure, his justice the most inflexible, I have ever known; no motives of interest or consanguinity, of friendship or hatred, being able to bias his decision. He was, indeed, in every sense of the word, a wise, a good, and a great man. His temper was naturally irritable and high-toned; but reflection and resolution had obtained a firm and habitual ascendency over it. . . . . His person was fine, his stature exact-

ly what one could wish. Though in the circle of his friends, where he might be unreserved with safety, he took a free share in conversation, his colloquial talents were not above mediocrity, possessing neither copiousness of ideas nor fluency of words. In public, when called on for a sudden opinion, he was unready, short, and embarrassed. Yet he wrote readily, rather diffusely, in an easy and correct style. He read little, and that only on subjects of agriculture and English history."

**Washington, Fort,** a Revolutionary fortress on Manhattan Island (New York city), captured by the British in 1776.

**Washington, Treaty of,** a treaty between Great Britain and the United States, signed May 8, 1871. Under its terms the "Alabama" claims, the San Juan boundaries, and certain fisheries disputes were settled by arbitration.

**Washington State College,** a coeducational, non-sectarian institution in Pullman, Wash.; opened in 1892; has a National land grant and income from the Hatch and Morrill funds; grounds and buildings valued at over $650,000; scientific apparatus, etc., $120,000; volumes in the library, 17,500; faculty, 100; students, 1,300; graduates, over 450.

**Washington and Jefferson College,** an educational institution in Washington, Pa.; founded in 1802, under the auspices of the Presbyterian Church; has an endowment exceeding $550,000; grounds and buildings valued at over $450,000; scientific apparatus, etc., $32,000; volumes in the library, about 20,000; average number of faculty, 30; average students, 460; graduates, over 4,300.

**Washington and Lee University,** an educational non-sectarian institution in Lexington, Va.; was founded in 1749 by the Rev. William Graham as an academy at Timber Ridge meeting house, afterward developed into Washington University, and finally received its present name in honor of General Robert E. Lee, who after the Civil War became its president. He is buried in the college chapel, where a noble recumbent statue in marble marks his resting place. The university has an endowment exceeding $835,000; grounds and buildings valued at over $375,000; scientific apparatus, etc., $50,000; volumes in the library, about 50,000; average number of faculty, 40; average student attendance, 570; graduates, over 3,500.

**Washington Monument,** a magnificent monument erected by the American people, in honor of George Washington. It stands in the Mall, a public park on the banks of the Potomac and Tiber creek, Washington, D. C. The corner stone was laid by President Polk, July 4, 1848, and Dec. 6, 1884, the cap stone was set in position. The foundations are 126½ feet square and 36 feet 8 inches deep. The base of the monument is 55 feet 1½ inches square, and the walls 15 feet ¼ inch thick. At the 500 foot mark, where the pyramidal top begins, the shaft is 34 feet 5½ inches square and the walls are 18 inches thick. The monument is made of blocks of marble two feet thick, and it is said there are over 18,000 of them. The height above the ground is 555 feet. The pyramidal top terminates in an aluminum tip, which is 9 inches high and weighs 100 ounces. The mean pressure of the monument is 5 tons per square foot, and the total weight, foundation and all, is nearly 81,000 tons. The door at the base, facing the capitol, is 8 feet wide and 16 feet high, and enters a room 25 feet square. An immense iron framework supports the machinery of the elevator, which is hoisted with steel wire ropes two inches thick. At one side begin the stairs, of which there are 50 flights, containing 18 steps each. Five hundred and twenty feet from the base there are eight windows, 18 x 24 inches, two on each face. The area at the base of the pyramidal top is 1,187¼ feet, space enough for a six-room house, each room to be 12 x16 feet. The Cologne Cathedral is 525 feet high; the pyramid of Cheops, 486; Strassburg Cathedral, 474; St. Peter's, at Rome, 448; the capitol at Washington, 306, and Bunker Hill monument, 221 feet. The Washington monument is the highest monument in the world; total cost, $1,500,000.

**Washington University,** a coeducational non-sectarian institution in St. Louis, Mo.; incorporated in 1853. It has been formed by the union of six schools started at different times: the undergraduate department, which includes the college (1859); the St. Louis Law School (1867); the O'Fallon Polytechnic School (1870); the Henry Shaw School of Botany (1886); the School of Fine Arts; the St. Louis Medical College (1891); and the Missouri Dental College (1892). To the university have been attached three secondary schools: The Smith Academy for boys (1854); the Mary Institute for girls (1859); and the manual training school (1879). The University has productive funds exceeding $6,000,000; grounds and buildings valued at over $2,800,000; scientific apparatus, etc., $540,000; volumes in the library, about 76,000; average number of faculty, 270; students, 2,100; ordinary income, about $500,000.

**Washita,** or **Ouachita,** a river of the United States and an affluent of Red river; flows in a S. E. direction through Arkansas and Louisiana, draining a rich cotton and corn country for a distance of 600 miles. It receives the Saline, La Fourche, Tensas, and Little Missouri rivers, and is navigable throughout the year by steamboats to Camden, a distance of 300 miles. The False Washita traverses the Indian Territory, and joins the Red river above Preston, in Texas.

**Wasielevski, Wilhelm Joseph von** (vä-sē-ā-lev'skē), a German violinist; born in Gross-Leesen near Danzic, June 17, 1822. He wrote: "The Violin and its Masters" (1869); "R. Schumann: A Biography" (1858); "The Violin in the 17th Century and the Beginnings of Instrumental Composition" (1874); "History of Instrumental Music in the 16th Century" (1878); "Schumanniana" (1883); "Beethoven" (2 vols. 1888); "The Violoncello and its History" (1889). He died Dec. 13, 1896.

**Wasilewski, Edmund** (vä-sē-lev'skē), a Polish poet; born in Rogozna, in 1814. The hardships, misfortunes, and sorrows of his life are reflected in the irony, doubt, despair, resignation, and spiritual revolt of his verse. Among his best productions were: "The Cracovians" (1840); "Child of Folly" (1845); "The Cathedral on the Wesel" (1846); etc. ("Various Poems," Cracow, 1839). He died in 1846.

**Wasite,** a mineral of a brownish-black color resembling allanite, found on the island of Rönsholm, near Stockholm. It contains silica, alumina, yttria,, sesquioxide of iron, cerium, didymium, calcium, manganese, etc., with a supposed new metal (wasium); a doubtful species.

**Wasp,** any species of the genus *Vespa* or of the family *Vespidæ*, particularly the common wasp, *V. vulgaris*. It lives in a hole in the ground, generally about six inches beneath the surface, approached by a crooked entrance of about an inch in diameter. This passage leads to a subterranean room, in which is the vespiary made of gray paper or pasteboard in layers one above the other, and constituting a ball of 13 or 14 inches in diameter, and pierced with two round holes, through which the wasps come in and go out. The interior is occupied by horizontal tiers of combs, like floors in a house, supported by columns, and with passages between. Each cell is hexagonal, as in the combs of bees, but the material is paper. These tiers of cells are built in succession, the upper ones first. Sexually wasps are of three kinds, males, females and neuters, the two latter armed with an exceedingly venomous sting. The last are the workers in the hive; they also go out to bring in provisions for the community. Wasps are nearly omnivorous, feeding on honey, jam, fruit, butcher's meat, and any insects which they can overpower. A share of these viands is given to the males and females, whose work lies more in the vespiary. The combs of a large nest may amount to more than 15,000. In these the females, which are few in number, deposit eggs, hatched in eight days into larvæ. These again go into the chrysalis state in 12 or 14 days more, and in 10 more are perfect insects. The males do no work. Most of the workers and all the males die at the approach of winter, and in the spring each surviving female having been impregnated in autumn, looks out for a suitable place to form a new vespiary. A wasp's nest may be destroyed by burning sulphur inside the hole. The economy of the other social wasps is essentially the same, whether like *V. holsatica*, they build a nest of paper in trees, or, like other Polistes, place their combs in trees or bushes without a papery defense. The economy of the solitary wasps is essentially that of their type, *Odynerus*, differing only in the material and locality of their nests, some building them of clay or agglutinated sand, and attaching them to or placing them in holes in walls, while a few burrow in sandy ground.

NEST OF COMMON WASP SEEN FROM BELOW.

**Wasp, The,** an American warship, built in Washington, D. C., in 1806, and commanded by Capt. Jacob Jones. She carried 18 guns and 137 men. On Oct. 18, 1812, she captured the British brig "Frolic," and was herself captured the same day by the British vessel "Poictiers." Also an American sloop-of-war, 22 guns and 160 men; built at Newburyport in 1814. On May 1, 1814, she left Portsmouth in command of Capt. Johnston Blakely. On June 28 she captured the British sloop "Reindeer," 18 guns and 118 men; and on Sept. 1, fought and captured the British brig "Avon." On Oct. 9 following she spoke and boarded the Swedish brig "Adams" and took from it two American sailors on their way from Brazil to England. Since that day she has never been heard from.

**Wasson, David Atwood,** an American clergyman, poet, and essayist; born in Brooksville, Me., May 14, 1823; was graduated at the Bangor Theological Seminary (1852); accepted a pastorate in Groveland, Mass., but was soon dismissed for the liberality of his views. He then devoted himself to literature, writing chiefly for periodicals. His works were collected as "Bugle Notes," "Seen and Unseen," "Ideals," etc. He resumed pastoral work

in Boston in 1865, preaching at the "Parker Memorial"; but his health failed within a year, and he was compelled to cease working. He died in West Medford, Mass., Jan. 21, 1887.

**Waste Lands,** according to the general use of the term, uncultivated and unprofitable tracts in populous and cultivated countries. The term waste lands is not employed with reference to land not reduced to cultivation in countries only partially settled. There is a large extent of waste lands even in the British Islands. Of the 77,800,000 acres which they contain only about 48,100,000 are arable land and improved pasture; 3,000,000 acres are occupied with woods and plantations; about 7,000,000 acres in Scotland consist of sheep pasture, generally at a considerable elevation, and little improved by art; 8,000,000 acres in Ireland are unenclosed pasture, gention, and little improved by art; 8,000,000 acres are mountain and bog; and the remainder consists of unimproved and very unproductive land of other kinds.

The waste lands of Great Britain are of very various character. Some of them are bogs, already sufficiently noticed in the article Bog (*q. v.*). Others are marshes and fens, generally very near the level of the sea, and often within the reach of its tides, chiefly in the E. counties of England. There are also extensive moors both in England and in Scotland, often of very poor soil, and often also at such an elevation above the level of the sea as to render profitable agriculture hopeless. This is not the case with all the moors, and it is sometimes possible to effect great improvement by drainage; so that land, formerly almost worthless, may be converted into good pasture. The highest sheep pastures of the S. of Scotland have been greatly improved by a kind of superficial drainage, consisting of mere open channels for water; but in the greater altitudes of the Highlands, and amid their more rugged steeps, even this is out of the question. The chalk downs of the S. of England may, in great part, almost be considered as waste lands, although in several parts they afford excellent pasture for sheep; while in certain districts they have been found capable of great improvement, in a slow and gradual manner, by tillage and the application of manures. Sands near the seashore are fixed by sowing certain grasses, and are capable of further improvement by cultivation and the application of manures; particularly where the sand is in considerable part calcareous. The most barren and hopeless sands are those which are almost entirely siliceous.

In Scotland, during the first 80 years of the 19th century, a large extent of waste land was by reclamation transformed into fairly good arable land. This process of reclamation was pursued to a lesser or greater extent in all the counties embracing mountain or moorland. It was most active in the N. counties, notably in the county of Sutherland, where between 1870 and 1880 the Duke of Sutherland expended nearly $1,000,000 in the reclamation of land. The Sutherland reclamations attracted great attention at the time, and were visited by many agriculturists from foreign countries as well as from distant parts of the United Kingdom. Viewed financially the reclamations have not been successful. The cost of the work was great, from $110 to as high as $325 per acre, and the benefits resulting from the reclamation have been lessened by the fall in the prices of agricultural produce. Already portions of the land have returned to a semiwaste condition. The advance in wages and the decline in the prices of agricultural produce have brought land reclamation almost to a standstill.

**Waste Products, Utilization of.** By "waste" is generally meant such material as is rendered either wholly or partially useless in the manufacture of products and articles of all kinds, but the name is sometimes retained long after a substance, at one time of little or no value, has been utilized. "Waste silk," for instance, is now a valuable material, though this name for it is kept up. If envelopes are cut out of a roll of paper, parts of dress out of a web of cloth, and round covers out of sheets of tinplate, "waste" pieces are unavoidably left. There would be more loss than gain in manufacturing such materials into the shapes required for specific articles. Again, when iron ore is smelted, or coal distilled, or common salt converted into soda, waste in some form results from the operations. In every manufacturing process, mechanical or chemical, there is waste. The examples given relate to new waste, but nearly everything we use wears, or corrodes, or gets broken or unshapely, and so rags, and rust, and scraps arise. Rags of all kinds are nowadays so much in demand that they are only waste in a nominal sense. On the other hand, the rust which arises from corroding iron is utter waste, since it can never be profitably collected at all. In respect to the value of "waste," these two, among familiar things, may be taken as at opposite extremes.

There is a kind of waste, for the most part difficult to prevent, which goes on in the consumption of fuel, and in certain processes of roasting or calcination in the smelting of metals. Roundly speaking, the best designed steam engines and boilers require only half as much coal per horse-power per hour as those less skillfully constructed, and the fuel unnecessarily consumed by bad

boiler furnaces is largely wasted as smoke through imperfect combustion. The Siemens regenerative furnace is most ingeniously constructed for the saving of waste heat. The utilization of blast furnace gases for heating purposes, and the recovery of tar and ammonia also produced by the coal consumed in these furnaces, form an instance of a double saving from the same source. In the report of the chief inspector of alkali works for 1891, it is stated that the plant put up in recent years for collecting tar, ammonia, etc., at 57 Scotch blast furnaces cost $2,223,000, a sum fully equal to the cost of building the furnaces themselves. The condensing flues, miles in length, connected with some lead-smelting furnaces are modern examples of appliances to condense lead fume or smoke which formerly was allowed to escape, causing much loss of lead. In striking contrast to these we may state, while speaking of gaseous products, that over a large district in the S. of Spain where cupreous iron pyrites occurs abundantly the barbarous practice is being continued of burning this pyrites in the open air (to get rid of its sulphur and so lighten its weight), to the destruction of vineyards and other vegetation, and to the loss of an enormous amount of sulphur sent into the air in the form of sulphurous acid. The acid used in "pickling" iron plates which are to be tinned or galvanized is now recovered.

Some instances of how waste in a solid form arises in working rock and other mineral substances may now be given. In shaping and dressing granite paving stones as much as three-fourths of the rock quarried is, in some instances at least, wasted. This waste is as yet only very partially utilized for road metal, and in small chips for "granolithic" pavements. Coal "dust" is made into briquettes (see BRIQUETTE) for burning in fires. The utilizing of the vast waste heaps of spent shale at the Scotch mineral oil works is a problem which awaits solution. The oil shale of the carboniferous formation in Scotland, from which PARAFFIN (*q. v.*) and paraffin oil are obtained, was itself looked on as of no value till 1859. Blast furnace slag is now utilized in several ways, and in a number of cases the accumulations of other kinds of slag on the sites of ancient smelting works have, in modern times, been again put through the furnace to extract the metals left in them, with profitable results. Some of the refuse from the old silver mines of Laurium has been bought up by capitalists for this purpose. One instance, though not of very recent date, may be given where, by the production of a by-product, a fortune was very quickly amassed. About 1840 Mr. Askin, of Birmingham, discovered a method of separating cobalt, in the

Waste Products

form of oxide, from nickel, two metals which were very difficult to separate. This oxide of cobalt was at first a waste product, but before very long it was put into the hands of potters, who readily bought it up to produce a blue color on their ware, at the then rate of two guineas per pound. Among comparatively recent instances of utilization of by-products and waste products in the chemical industries, we may refer to the importance of the substances now extracted from COAL TAR (*q. v.*), and the great value of some of them in the manufacture of dyes. Another example is the recovery of binoxide of manganese in the production of chlorine for the manufacture of bleaching powder by Weldon's beautiful process. Formerly for every 100 pounds of bleaching powder made about 100 pounds of the native oxide of manganese were required. Now this manganese is recovered and used again and again in the process, with only a loss of about 5 per cent. to make up each time it is returned to the chlorine still. The earlier methods of recovering manganese were not nearly so perfect, and therefore were not much used. A process for the utilization of chemical waste on a great scale is Chance's method, patented in 1888, of recovering sulphur from alkali makers' black-ash refuse.

Passing to vegetable substances, the various materials besides rags used in the manufacture of paper may be first noticed. Straw, wood, and esparto fiber, if not exactly waste products, were at least undeveloped substances before they became, as they now are, so largely used in paper making. Old ropes, flax and jute mill waste, old or torn pieces of paper of every kind, are all serviceable in paper mills or in the manufacture of millboard. In the pulp of the latter old newspapers bulk largely. Cotton waste is much used by mechanical engineers for cleaning purposes. Sawdust is employed in several ways. Corkcutter's waste has become of high importance in the manufacture of linoleum and cork carpet. From the bark stripped from osier wands the useful medicine salicin is now made. In days not so long past the spent madder of our large dyeworks was suddenly raised from a useless to a valuable material by treatment with sulphuric acid, which converted it into the dye called garancin. Madder itself, which till 1869 held a chief place among our dyestuffs, has since become of trifling importance, through the introduction of ALIZARIN (*q. v.*). This is hardly the place to refer to the utilization of PEAT (*q. v.*), but it may be remarked that this material, so abundant in Ireland and Scotland, is in Russia, Germany, and Holland turned to profitable account in several ways, by methods which have not yet succeeded in Great Britain. From the sea-

weed thrown up on British shores iodine is obtained, but, though some is also used as manure, much of it is allowed to decay (see KELP).

One of the most interesting examples of what has been done in converting a waste animal product into a highly useful material is seen in the case of waste silk. Cocoons do not yield half their weight of reeled silk, but the remaining "waste" portion has, through the ingenuity of an English inventor, become the raw material for a large spun silk industry (see SILK). In Venice artificial flowers for ladies' head dresses are made of imperfect cocoons. The various kinds of waste from woolen mills and from the cutting up of woolen fabrics are either worked up again into yarn or felt (see SHODDY), or are ground into flock for paper hangings. GLUE (*q. v.*) is made from parings of hide and from bone. The turnings and dust of the ivory and bone turner have various useful applications. Prussiate of potash is made from almost any waste animal matter, such as parings of horns and hoofs, hair, blood, leather cuttings, and even field mice.

**Watch,** the act or state of watching; a keeping awake for the purpose of attending, guarding, preserving, or the like; attendance without sleep; vigilance, vigil.

> "Had your watch been good,
> This sudden mischief never would have fallen."
> Shakespeare: "Henry VI.," Pt. I., ii. 1.

A person or number of persons set for a guard over the persons, property, or interests of others; a watchman or body of watchmen; a sentry, a sentinel, a guard. Also, the period of time during which one person, or a body of persons, watch or stand sentinel, or the time from one relief of sentinels to another; hence, applied to a division of the night when the precautionary setting of a watch is more generally necessary. Among the Romans, the time from sunset to sunrise was divided into four equal spaces or watches, severally distinguished as first, second, third, and fourth watches, each containing three hours; but these hours varied in length, being longest in winter and shortest in summer, and the watch contained three of our hours only at the equinoxes. The Greeks also divided the night into four watches. The proper Jewish reckoning recognized only three of these watches, the first, from sunset till about 10 P. M., the second, or middle watch, from 10 P. M. to 2 A. M., and the third or or morning watch, from 2 A. M. to sunrise. After the establishment of the Roman power, the watches were increased in number to four, which were known as first, second, etc., or as even, midnight, cock crowing, and morning, the watches terminating respectively at 9 P. M., midnight, 3 A. M., and 6 A. M. (Ex. xiv: 24, Judges vii: 19, Matt. xiv: 25, Mark xiii: 35).

Also any contrivance by which the progress of time is perceived and measured; as, a timekeeper actuated by a spring, and capable of being carried on the person. The essential difference between a clock and a watch has been defined to be that the latter will run in any position, but the former in a vertical position only. Since the invention of the cheap spring clock this definition must be abandoned. Another characteristic which was formerly distinguishing was that the watch escapement was always controlled by a balance wheel and spring, while the clock escapement was generally governed by a pendulum. Watches are said to have been invented at Nuremberg, about the end of the 15th or beginning of the 16th century. The essential portions of a watch are the dial, on which the hours, minutes, and seconds are marked, the hands, which by their movement round the dial point out the time, the train of wheels, which carry round the hands, etc., the balance, which regulates the motion of the wheels, and the mainspring, whose elastic force produces the motion of the whole machinery. The works are inclosed in a case of metal, usually silver or gold. The shape is now universally circular and flat, so as to be easily carried in the pocket. The early watches had but one hand, and required winding twice a day. The spring was at first merely a straight piece of steel, not coiled. A spring to regulate the balance was first applied by Dr. Hooke, 1658; this was at first made straight, but soon improved by making it of spiral form. A repeating watch, or repeater, has a small bell, gong, or other sounding object, on which the hours, half hours, quarters, etc., are struck on the compression of a spring, The most perfect form of watch is the CHRONOMETER (*q. v.*).

As a nautical term, the period of time occupied by each part of a ship's crew alternately while on duty. This period is one of four hours, the reckoning beginning at noon or midnight. But in order to prevent the constant falling of the same watch to the same portion of the crew, the time between 4 P. M. and 8 P. M. is divided into two short watches of two hours each, technically known as dog watches. Thus, the watch from 12 noon to 4 P. M. is the first afternoon watch; that from 4 P. M. to 6 P. M. the first dog watch; and that from 6 P. M. to 8 P. M. the second dog watch; from 8 P. M. to midnight is the first night watch; from midnight to 4 A. M. the middle watch; from 4 A. M. to 8 A. M. the morning watch; and from 8 A. M. to noon the forenoon watch. When this alternation of watches is kept up during the 24 hours, it is termed having watch and watch, in dis-

tinction from keeping all hands at work during one or more watches. An anchor watch is a small watch composed of one or two men set to look after the ship while at anchor or in port. Also, a certain portion of the officers and crew of a ship who together attend to working her for a certain period. The crew of every ship while at sea is generally divided into two portions — the starboard watch, which in the merchant service is the captain's watch, and is often commanded by the second mate; and the port watch, which in the merchant service is commanded by the first mate. In the navy these watches are commanded by the lieutenants successively.

In pottery, a trial piece of fire clay so placed in a pottery kiln as to be readily withdrawn, to enable the workmen to judge of the heat of the fire and the condition of the ware.

**Water,** a clear, colorless, transparent liquid, destitute of taste and smell, and possessing a neutral reaction. It is one of the most important and most widely-distributed substances in nature, occurring universally in one or other of its three physical states = liquid, solid, or gaseous. As a liquid it constitutes the great mass of the oceans, rivers, and lakes, which cover nearly three-fourths of the earth's surface; in the solid state it exists permanently in the form of ice or snow in the polar regions; and as a vapor is a constituent of the aërial envelope of the earth, and the exhalations of volcanoes and boiling springs. It occurs in combinations in many mineral substances, and also in organic bodies, animals, and plants containing from 80 to 90 per cent. Water is the most efficient of all solvents, there being few substances which are not, to some extent, affected by it, hence natural waters never occur absolutely pure, but contain in solution more or less of the constituents of the strata through which they have passed. Rain water contains substances derived in minute quantities from the atmosphere, such as ammonia, nitrate of ammonia, carbonic acid, nitrous and sulphurous acids. Spring water always contains a much larger proportion of dissolved substances than rain water. When this is so highly charged with saline or gaseous constituents, as to have a peculiar taste or smell, and is unfitted for ordinary use, it is called Mineral Water (*q. v.*), and when the amount of these constituents does not sensibly affect its taste, etc., it is described as fresh water. Sea water is essentially a mineral water, its saline constituents consisting of the chlorides and sulphates of sodium, potassium, magnesium, and calcium, together with minute quantities of silica, bromine, iodine, phosphoric acid, etc. The total solid contents of sea water in mid-ocean varies from 30 to 40 grammes per liter, being largest near the equator and smallest near the poles. A cubic inch of fresh water at 42° weighs .036126 pounds. A cubic foot weighs 62.321 pounds. A cubic foot contains 6.2321 gallons. One gallon weighs 10 pounds. A ton comprises 35.943 cubic feet. Salt water is slightly heavier than fresh.

The term water is applied to the color or luster of a diamond or pearl, and occasionally of other precious stones; as, a diamond of the first water — *i. e.*, one perfectly pure and transparent. In chemistry, $H_2O$. Water was long regarded as an element, but toward the end of the 17th century it was shown by Lavoiser to be a compound, and to consist of 2 parts by weight of hydrogen to 16 of oxygen, or two volumes of hydrogen to one of oxygen. When pure it is free from taste and smell, and at ordinary pressure is liquid between 0° and 100°, boils at 100°, and freezes at 0°C., expanding to the extent of one-eleventh of its volume. The quantity of heat absorbed in the melting of ice is sufficient to raise the temperature of an equal weight of water 79.2°, and the quantity of heat rendered latent by water at 100°, becoming vapor, would raise the temperature of water 5.37 times as much as from 0° to 100°. Water is 825 times heavier than air, and when converted into steam expands to nearly 1,600 volumes. One cubic centimeter at 4°, and under a pressure of 760mm. of mercury, weighs 15.432349 grains, or one gramme, the unit of weight in the metric system.

In commerce, stock issued without any provision being made for the payment of interest thereon. In geology, water is one of the two most potent agencies in working geological changes on the earth's surface. In most cases it acts in direct antagonism to the other very potent cause, fire. Every river descending a mountain slope, or crossing a plain, to reach the ocean carries with it, especially after heavy rain, abundant sediment, as does every tributary great or small. Much of this sediment reaches the sea, where, if the water be deep, it is lost for a time, while, if the water be shallow, it may gradually build up a delta, which an earthquake shock may convert into land fully reclaimed from the ocean. The bowlders, gravel, etc., too heavy to be transported so far, are arranged according to their weight, the heaviest falling first. The expansion of water when it freezes in the crevices of rocks enables it in many cases to rend them asunder, and leave them of more manageable size to be transported. In law, land is held to include water, but not water land. If the possession of a lake be disputed, the action must be brought, not for so many acres of water, but for so many acres of land cov-

ered with water. Aërated water is carbonated water.

**Water Analysis,** in chemistry, the estimation of the dissolved contents of water under the three heads of gaseous, mineral, and organic matter, the latter including floating microcosms; but the term more generally refers, in the case of potable waters, to the determination of the organic matter and total mineral residue, without the separation of the latter into its constituent parts. No process of analysis does more than estimate the relative amount of organic matter; nor, excepting by the aid of the microscope, is any attempt made to differentiate between what is harmless and what is presumably hurtful. Wanklyn's method involves the estimation of the ammonia produced by boiling with permanganate of potash, and the amount of oxygen consumed as shown by the reduction of the permanganate. Frankland proceeds to determine the organic nitrogen and carbon, and from the results arrives at his conclusions respecting the purity of the water. Tidy allows the permanganate to react on the water at common temperatures, and determines the loss of permanganate at the end of one hour and three hours respectively. Whichever method is adopted, there are certain minimum limits below which a water is considered good, and above which it is regarded as either of doubtful quality or likely to prove injurious. The statement of the various limits and attendant circumstances connected with the source of the water supply, and which go to qualify the results obtained, are to be found described at length by the authors referred to in their published methods of analysis.

**Water Antelope,** a comprehensive name for the genus *Eleotragus* and its allies, from the fact that most of the species abound in marshy districts on the banks of the African rivers.

**Water Balance,** an oscillating pendulous frame, having a series of troughs in vertical series and inclined in alternate directions, so that, as the frame oscillates, the water dipped by the lower one shall be poured into the next above, which, on the return motion, shall pour it into the next, and so on.

**Water Barometer,** a barometer in which water is employed instead of mercury for indicating the fluctuations in atmospheric density.

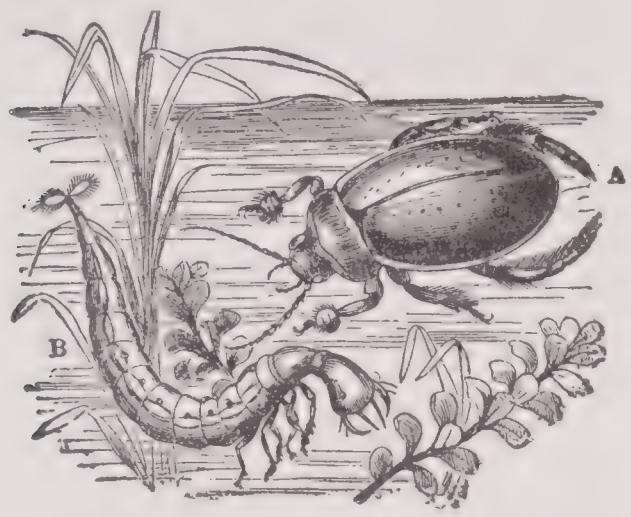
**Water Bath,** in ordinary language, a bath of fresh or salt water, as distinguished from a vapor bath. In chemistry, a copper vessel, having the upper cover perforated with circular openings from two to three inches in diameter. When in use it is nearly filled with water, which is kept boiling by means of a gas burner, and the metallic or porcelain basin containing the liquid intended to be evaporated is placed over the openings mentioned above.

**Water Bed,** a device that originated with Dr. Neil Arnott, one of Queen Victoria's physicians. It consists of a trough of the dimensions of a wide sofa or a bed, having six or seven inches depth of water in it, and over it a caoutchouc covering on which clothes and pillows are laid as in a common bed. A more convenient and portable contrivance is the water mattress, consisting of a caoutchouc or waterproof bag of the size of an ordinary mattress, which may be filled with water of any degree of temperature, or with air, as may be desired. The water bed is exceedingly useful in many diseases, but it is frequently a considerable time before the patient can become accustomed to its use, and some can never be reconciled to it. A person weakened from disease often suffers considerable pain from pressure, and it is necessary for the comfort of the patient that his position be changed frequently. This is in great measure obviated by the water bed. In other cases sensation is blunted, and the patient remaining for lengthened periods in one position, surfaces exposed to long-continued pressure are apt to slough, causing bed sores, and such may only be discovered accidentally. In such cases the water bed relieves the pressure, and thus prevents the formation of bed sores. In all diseases in which the patient is confined long to bed, as in lingering consumption, paralysis, disease of the spine, and fevers with delirium, the water bed is of great value.

**Water Bellows,** a form of blowing machine consisting of two or more inverted vessels suspended from the ends of a working beam, and alternately rising and falling in the cisterns which are nearly full of water. Induction and eduction pipes pass from below upward into the cisterns, their upper open ends being above the level of the water. The induction pipes have valves on the top, and the eduction pipes have valves at the bottom, so that the air cannot pass in the wrong direction.

**Water Beetles,** beetles which live on or in the water, especially the somewhat similar *Amphizoideæ*, *Haliplidæ*, *Dytiscidæ*, and *Gyrinidæ*, and also the quite different clavicorn *Hydrophilidæ*. The *Dytiscus*, common in stagnant water, is olive-green above, and oval in shape. The respiratory organs of the perfect insect are not adapted to obtaining air from the water; the creature must therefore come occasionally for air to the surface of the water, where it lies on its back, the openings of its airtubes, which

are in the last segment of the abdomen, being exposed.




GREAT WATER BEETLE.

a, full-grown insect; b, larva.

**Water Brash,** an affection of the stomach, the result of a general functional debility of that organ, by which the vessels that should secrete the gastric juice throw out a clear, limpid water; hence its medical name of pyrosis. The symptoms of this disease usually commence when the stomach is empty, either in the morning or the afternoon, and begin with a sense of burning heat and constriction at the pit of the stomach, producing a sensation as if the organ was being drawn up to the spine. To relieve this sensation, the patient folds his arms over his chest, and bends the body forward; after a time, a quantity of gas collecting in the stomach leads to an eructation, the patient bringing up from two to four ounces of clear, limpid water, sometimes, though rarely, acid, but generally insipid. Two or three eructations, with a gush of water after each, concludes the paroxysm, and for the time the patient is relieved of his suffering. Females are more subject to this disease than men, and those who live on a milk or farinaceous diet more than those who partake of a good stimulating dietary. Water brash is an affection to which those of a sedentary habit, and who eat their meals hurriedly, without proper mastication, are liable.

**Water Bug** (otherwise "WATER SCORPION" and "WATER BOATMAN"), the name given to a section of the hemipterous family *Notonectidæ*. The hind legs are long, and adapted for swimming. The body is prismatic in form, convex above and flat beneath, and the head is as large and as wide as the body. The antennæ are four-jointed. *Notonecta* is the typical genus of the family. To the allied family *Nepidæ* also belong species of the water bug, more especially named "water scorpion." *Nepa cinerea* is a familiar species. In *Nepa* the body terminates in a long breathing tube, and the antennæ are three-jointed. The water bug is predaceous, living chiefly on the larvæ of other insects.

**Waterbury,** a city in New Haven co., Conn.; at the confluence of the Naugatuck, Great Brook, and Mad rivers, and on the New York, New Haven, and Hartford, and the New England railroads; 33 miles S. W. of Hartford. Here are the Academy of Notre Dame, St. Margaret's School (P. E.), a high school, a Masonic Temple, a State armory, public library with over 50,000 volumes, many handsome churches and residences, waterworks, street railroad and electric light plants, National, savings, and other banks, and several daily and weekly newspapers. Waterbury is famous as the center of a vast manufacturing business in watches and clocks. Other manufactures include buttons, plated ware, pins, hooks and eyes, percussion caps, carriages, lamps, etc. The metal working industries were established here prior to 1800, and for a long period Waterbury was the only city in the United States engaged in these industries. The assessed property valuations are nearly $14,000,000. The town was incorporated in 1686, and received its city charter in 1853. In February, 1902, a large part of the business section of the city was destroyed by fire. Pop. (1890), 28,646; (1900) 45,859; (1910) 73,141.

**Water-Color Painting,** the most delicate of the graphic arts, is in an especial sense an English art. It was in England first that it attained to the dignity of a recognized artistic pursuit, and came to be — what it now is — admittedly the rival of oil painting in brilliancy and power. It has had a large share in the modern prosperity of the fine arts, and of late has been practised by eminent artists in various countries, as France, Germany, Austria, and the United States. In the illumination of missals water colors were used mixed with the body white; and the same is true of the miniature painting of the 18th century. Frescoes and painting in tempera were also in a sense works in water color. But the art of water color, as we now understand the term, had its origin in quite a different way. Dürer and certain of the German, Flemish, and Dutch artists were accustomed to outline drawings with a reed pen, and fill in those outlines with an auxiliary flat wash. Gradually the hard lines were replaced by touches with the brush, and the result was a monochrome in browns and grays, bistre or India ink. These again came to be tinted, and so suggested the full use of colors. Rembrandt often drew in brown, and added dashes of strong color; and Rubens produced something very like modern water-color drawings.

The modern art became emancipated from the old traditions by "gradual dis-

use of the general shadow tint, and imitation of the local color, not alone of the objects themselves, but of every modification resulting from light, dark, half-tint, or distance, a method which at once led to far greater truth and richness than could ever have been attained by merely passing color over the universal shadow tint." The stained drawing gradually gave way to the more perfect tinted drawing. But the tinted style predominated till 1790; and it may be said that the water colors of the 18th century were tinted monochromes. It was in the 19th century that Girtin and Turner showed what scope and power there were in the art.

Artists who used the stained and tinted manner were Malton (1726–1801), Paul Sandby, R. A. (1725–1809), often called, though without justification, "the father of water-color art;" also, all in the last half of the 18th century, Grimm, Webber, Cleveley, Pars, and Rooker. Wheatley, Westall, and Gilpin used water color as well as oil. Rowlandson, Cristall, Hills, Wright, Mortimer, Gresse, Hearne, J. R. Cozens, and Dayes greatly promoted the growing art. Nicholas Pocock (1749–1831) displayed a new richness and force. John Smith (Warwick Smith) first got beyond the weakness of mere tinting. Thomas Girtin (1773–1802) attained great richness of tone and breadth; his compositions were grand but simple; he massed light and shade in broad and sometimes abrupt forms. J. M. W. Turner (1775–1851) soon distanced all his predecessors and contemporaries, and in his hands water-color painting became a new art. He wholly abandoned preliminary tinting; minute details are imitated in local color; his work is marked by breadth, fullness, warmth as well as grace. Other more or less important names are those of Delamotte, Varley, J. J. Chalon, A. E. Chalon, Samuel Prout, Peter de Wint, Liverseege, Cotman, David Cox, Essex, Richardson, Newton, Bonington, Copley, Fielding, Robson, W. Hunt, Ross, Harding, Cattermole, Holland, Penley, Lewis, Houghton, and Pinwell; more recent are Birket Foster, Sir John Gilbert, etc.

The Society of Painters in Water-Color was instituted in 1804; it held its first exhibition in 1805; and its annual exhibitions are now as crowded as those of the Royal Academy. Formal recognition of its dignity was accorded in 1882, when the society obtained a charter, and became the Royal Society of Painters in Water-Color. There are other similar associations, as the Institute of Painters in Water-Color. An admirable collection illustrative of the history of the art may be studied in the South Kensington Museum.



**Water Colors,** pigments prepared for the use of artists and others by mixing coloring substances in the state of fine powder with a soluble gum such as gum arabic. These are made up in the form of small cakes, which are rubbed down with water and applied with a brush to paper, ivory, and some other materials. Moist water colors are made up with honey or glycerine as well as gum, and are prepared so as to be kept in small earthenware pans or metallic tubes. Dry cakes require to be rubbed down with water on a glazed earthenware palette or slab, but moist colors can be mixed with water for use by the friction of a brush, so that the japanned lid of the box which contains them serves for a palette. The latter are accordingly very convenient for sketching from nature.

In water-color painting two methods are employed; by one the artist works in transparent colors, by the other in opaque or body colors. In working by the latter method, which somewhat resembles oil painting in its nature, Chinese white is mixed with light colors to give them body. Not only is there much artistic work done solely in transparent colors, but it is almost always these that are used for tinting mechanical drawings, maps, and the like. Some artists freely combine transparent, semi-transparent, and opaque colors. The quick drying of the water-color pigments is favorable to rapid execution; and greater clearness is attained than is practicable in oils. In water-color painting the texture of the paper employed is often of importance. Water-color drawings are of course more easily injured by damp than oil paintings.

**Water Cress.** See NASTURTIUM.

**Water Cure.** See HYDROPATHY.

**Water Crowfoot,** in botany, the *Ranunculus aquatilis.* The stem is submersed, the leaves beneath the water being capillaceously multifid, those which float trifid or tripartite, with cut or crenated lobes, the petals white. Common in lakes, ponds, and ditches, flowering from May to August.

**Water-distilling Ships,** ships fitted out by the United States navy, in 1898, to supply warships, auxiliary craft, and transports with absolutely pure water. They were supplied with the most modern machinery for distilling salt water and each had a capacity of 200 tons of ice daily. Some of them were able to turn out 60,000 gallons of the purest distilled water every day.

**Water Dog,** a variety of the dog having a curly coat, long ears, a rounded head, and webbed toes. It seems to be allied to the poodle, but differs from the latter in its firmer set and stouter body, and in its larger size. The water dog is highly intel-

ligent, but less so than the retriever. It is usually of a greyish white varied with black and brown.

**Water Dropwort** (*Œnanthe*), a genus of plants of the natural order *Umbelliferæ*; having ovato-cylindrical fruit, not prickly nor beaked, each carpel with five blunt convex ribs, and single vittæ in the interstices; the calyx teeth lanceolate; the petals obcordate and radiant, with an inflected point; the partial involucre of many rays; the flowers of the circumference on long stalks and sterile, those of the center subsessile and fertile. A number of species are natives of Great Britain, large perennial plants, with a strong and generally disagreeable aromatic smell, and compound or decomposed leaves. The common water dropwort (*Œ. fistulosa*) and the hemlock water dropwort, or water hemlock (*Œ. crocata*), are both common in wet places in Great Britain and throughout Europe, and both are narcotic acid poisons. The roots of the latter have some resemblance to parsnips, and hence fatal accidents have frequently occurred. The fine-leaved water dropwort, called water fennel by the Germans (*Œ. phellandrium*, formerly known as *Phellandrium aquaticum*), is also common in ditches and ponds both in Great Britain and on the Continent. It has a jointed root stock (*rhizome*), with tufted whorled fibers, and a strong zigzag stem dilated at the base. It is not so poisonous as the other species just named. It was at one time erroneously regarded as a specific against pulmonary consumption; but it has been advantageously employed in pulmonary complaints.

HEMLOCK WATER DROPWORT.

**Waterfall.** See CATARACT.

**Water Ermine,** a tiger moth, *Arctia urticæ*. Wings white, the fore pair each with a black dot; head and thorax white, body yellow, the tip snowy white, with a row of black spots down the back, and one on each side. Caterpillar black, very hairy. It feeds in marshy places on mint, willow herb, etc., concealing itself on the under side of the leaves. The moth appears in June.

**Water Flea,** a popular name for minute aquatic Crustaceans such as daphnia among *Cladocera* cypris among *Ostracoda*, and cyclops among *Copepoda*. The common *Daphnia pulex*, abundant in fresh water, is a good representative. The body is enclosed in a bivalve shell; there is a large single eye; a pair of large antennæ are used as swimming organs. The daphnids are marvellously prolific, and for prolonged periods parthenogenetic. There is an interesting difference between the winter eggs which require fertilization and the summer eggs which do not. The females have a dorsal brood chamber between the shell and the back. Of related genera *Sida*, *Moina*, *Lynceus*, *Polyphemus*, and *Leptodora* may be noted. In cypris also the shell is bivalve; there are five pairs of appendages on the head and two on the body; most of these are used in swimming or creeping. Related to cypris but living in the sea are *Cythere*, *Halocypris*, *Cypridina*, etc. Among cyprids parthenogenesis again occurs, and in some species males have never been observed, while parthenogenetic development has been traced for as many as 40 successive generations. The females bear large egg sacs. In cyclops the body is more distinctly segmented and the shell is not bivalve; the head bears antennæ, mandibles, and maxillæ, and the first five segments of the thorax bear swimming appendages. Resembling cyclops

WATER FLEAS.

1, Cyclops communis; 2, Cypris unifasciata; 3, Daphnia pulex.

and also a fresh-water form is *Canthocamptus*, while *Cetochilus* and *Clausocalanus* represent numerous marine *Copepods*. Water fleas feed on microscopic plants and animals and on organic debris, while they

themselves — often occurring in countless swarms — form an important part of the food supply of certain fishes.

**Waterford,** a city and capital of Waterford co., Ireland; itself a county of a city; on the right bank of the Suir; and connected with its N. suburb of Ferrybank, by a bridge. Of six Catholic places of worship, including a cathedral, the finest is the Dominician Church of St. Savior, erected (1878) in the Italian style at a cost of $55,000; and the Protestant Episcopalians have also a cathedral and two churches. Other buildings are the Protestant Episcopal palace, the Catholic College of St. John, St. Dominic's Industrial School, four convents, a town hall, market house, etc. Up to 1871 $115,000 had been expended in deepening the channel of the Suir, whose S. bank is fringed for a mile by a spacious quay, while on the Kilkenny side is a shipbuilding yard, with a patent slip, graving bank, and dock. Besides two immense bacon-curing establishments, Waterford has iron foundries, flour mills, breweries, etc. A memorial of Waterford's foundation by the Danes in the 9th century is "Reginald's Tower" (1003), which has witnessed the city's capture by Strongbow (1170), the repulse of Cromwell and surrender of Ireton (1649–1650), and the embarkation of James II. after the battle of the Boyne (1690). Pop. (1901) 26,743.

**Water Gas,** gas obtained by the decomposition of water. Water in the form of steam is passed over red-hot coke, resolving it into hydrogen and carbonic oxide, the oxygen being absorbed. The hydrogen and carbonic oxide are then passed through a retort, in which carbonaceous matter, such as resin, is undergoing decomposition, absorbing therefrom sufficient carbon to render it luminous when burned.

**Water Gilding,** a mode of gilding by an amalgam in which the articles are pickled and then dipped in or brushed with a dilute solution of nitrate of mercury and gold, called quick-water, which leaves a film of amalgam on the surface. After dipping, the articles are exposed to heat in a cage within a furnace, and the mercury is thus driven off. The gold surface is then polished with a bloodstone burnisher.

**Water Glass,** a substance which, when solid, resembles glass, but is slowly soluble in boiling water, though it remains unaffected by ordinary atmospheric changes. It consists of the soluble silicates of potash or soda, or a mixture of both. It is prepared either by breaking down and calcining flint nodules, the fragments or particles of which are then added to a solution of caustic potash or soda, whereupon the whole is exposed for a time to intense heat, or by fusing the constituents together in a solid state, and afterward reducing them to a viscid condition. Among the purposes to which water glass is applied are painting on glass, coating stone, wood, and other materials to render them waterproof, glazing scenery and paintings, fixing wall paintings, etc.

**Water Hammer,** a vessel partly filled with water, exhausted of air and hermetically sealed. When reversed or shaken, the water, being unimpeded by air, strikes the side with a sound like that of a metal striking against glass.

**Water Hemlock.** See COWBANE.

**Water Hen,** the *Gallinulus chloropus*, generally distributed throughout the world. Length of male about 13 inches; back, wings, rump, and tail rich dark olive-

WATER HEN.

brown; head, neck, breast, and sides dark slate gray; thighs and flanks streaked with white, belly and vent grayish white; under tail coverts white; beak yellowish, becoming red, as Pennant notes, in the breeding season; naked patch on forehead red; red garter above tarsal joint; legs and toes greenish-yellow, claws dark-brown. The female rather larger and more vividly-colored than the male. They frequent ponds covered with aquatic herbage, overgrown watercourses, and the banks of slow rivers, swimming and diving with facility, assisted by an expansion of the membrane along the sides of the toes.

**Waterhouse, Alfred,** an English architect; born in Liverpool, England, July 19, 1830; studied architecture in Manchester, France, and Italy; gained the competition for the Manchester Assize Courts, and also designed the Owens College and the town hall in that city. Among his chief works in London are the Natural History Museum at South Kensington, the New University Club, the National Liberal Club, the New St. Paul's Schools, the City and Guilds' institute, and University College Hospital. He also partly reconstructed Balliol College, Oxford, and Caius and Pembroke, Cambridge. He was elected a royal academician in 1885. He died Aug. 22, 1905.

**Water Inch,** a measure of water equal to the quantity discharged in the 24 hours through a circular opening of one inch diameter leading from a reservoir under the least pressure, that is when the water is only so high as to cover the orifice. This quantity is 500 cubic feet very nearly.

**Watering-Pot of America, The,** Utica, N. Y. A few years ago the Utica Driving Park was first opened for running and trotting races. For some reason, not yet understood, whenever an unusually large crowd attended, it rained from first to last. Whenever the races were postponed the rain was likewise put off, and as often as the horses were called, a shower also came on. Eventually the sun smiled on the races. To this day, far and near, horsemen know Utica only as "the Watering Pot of America."

**Waterland, Daniel,** an English clergyman; born in Lincolnshire, Feb. 14, 1683; studied at Cambridge, became master of Magdalen College, chaplain to George I., and Canon of Windsor. Waterland was an able and zealous defender of the orthodox faith against the English Deists and other "infidels" of the period. He builds principally on the historical argument. His writings are entirely controversial; the chief are "A Vindication of Christ's Divinity, being a Defence of some Queries relating to Dr. Clarke's Scheme of the Holy Trinity" (1719), followed by a second (1723) and third (1725) Vindication; a "Critical History of the Athanasian Creed" (1724), also directed against Clarke; "Christianity Vindicated Against Infidelity" (in three parts, 1730–1732), a reply to Tindal's "Christianity as old as the Creation"; and a "Review of the Doctrine of the Eucharist" (1737), directed against Hoadley's rationalistic interpretation of that ordinance. A complete edition of Waterland's works, with a "Life by Bishop van Mildert," was published at Oxford (11 vols. 1823–1828; new ed. 6 vols. 1843). He died Dec. 23, 1740.

**Water Level,** a leveling instrument in which water is employed instead of spirit. It consists of a metal tube, bent at both ends, in which are fitted glass tubes. It is placed on a tripod, and water poured in till it rises in both legs. When the liquid is at rest, the level of the water in both tubes is the same; that is, they are both in the same horizontal plane.

**Water Lily** (*Nymphæ*), an exogenous aquatic plant of the order *Nymphaceæ*, including eight genera, and all possessing submerged root stocks. They are found in all temperate climates, and attain great size in the tropics. *N. alba* is the familiar flower of ponds and placid streams throughout Great Britain and North America, its large and chaste flowers claiming precedence for beauty among the indigenous flora. *N. lotus* has similar flowers, but tinted with pink, and has strongly toothed floating leaves; it is the white lotus of the Nile. The blue lotus (*N. cærulea*) has fragrant blue flowers. Several species and numerous varieties are in cultivation as ornamental plants, including the above and *N. odorata* of North America. In India the seeds are used as food. In the allied genus *Nuphar* the flowers are yellow, and the common species (*Nuphar luteum*) is known as the yellow water lily. It is a frequent British plant of still waters. The flowers are fragrant, with an alcoholic odor, hence its further name of "brandy bottle." The root stock abounds in tannic acid. The *Victoria Regia* is the name given in honor of Queen Victoria to the most magnificent genus of the order. There is only one species recognized by botanists, a native of the Amazo-

WHITE WATER LILY.

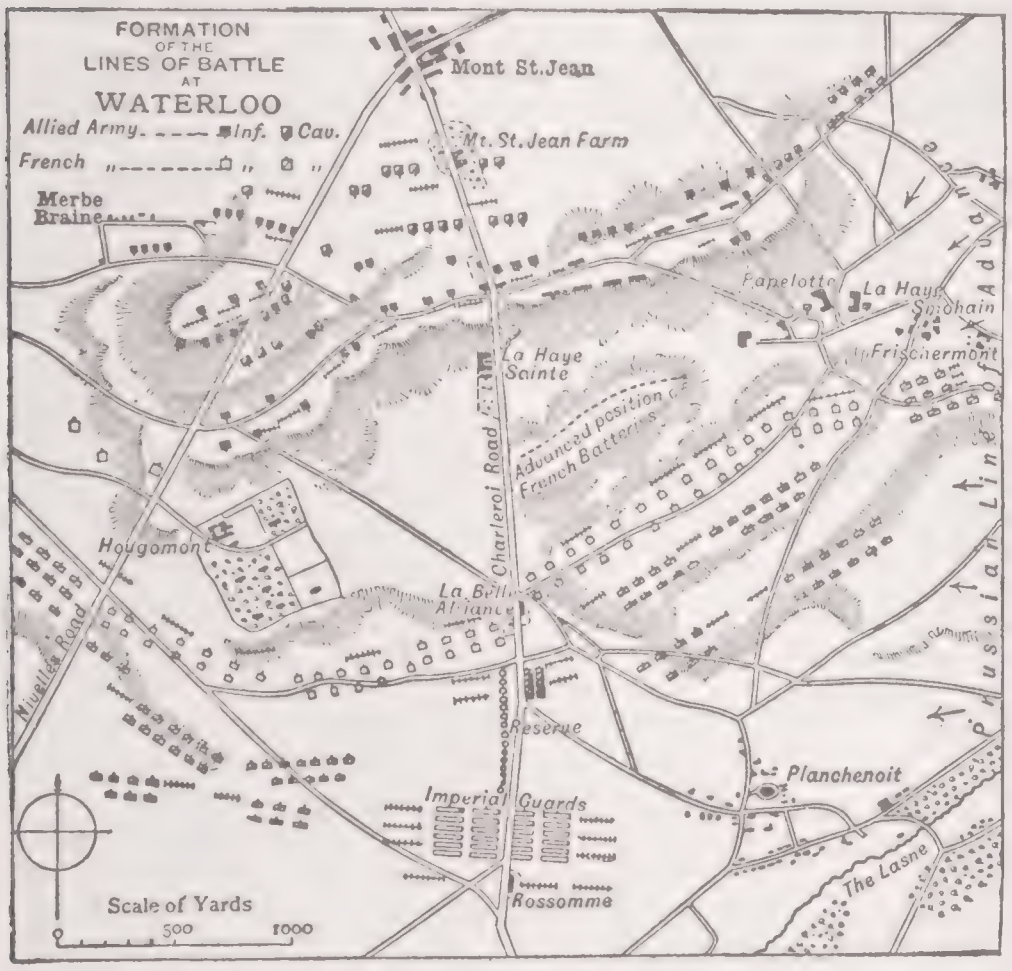
nian region of South America, where it was first observed by the unfortunate botanical traveler Hænke, in 1801, and said to have been met with by the French naturalist D'Orbigny in 1827, but not made known to European horticulturists till after its discovery in British Guiana 10 years later by Sir Robert Schomburgk. This noble water lily has floating leaves of a bright green above, and a deep purple or violet on the lower surface, measuring as much as 7½ feet in diameter, with a uniformly turned-up margin of about 3 inches, thus resembling huge shallow trays. The flowers, which are proportionately as large — some measuring 14 inches in diameter — are of all shades from white to pink, and are delightfully fragrant. The fruit is globular, thickly beset with formidable prickles. The seeds are edible.

**Water Line,** in shipbuilding, the boundary of any section of the bottom of a ship made by a plane parallel to the line of flotation. The uppermost one is called the load water line; the lowest the light water line.

**Waterloo,** a city and county-seat of Blackhawk co., Ia.; on the Cedar river, and on the Illinois Central, the Chicago Great

Western, and the Burlington, Cedar Rapids, and Northwestern railroads; 6 miles E. S. E. of Cedar Falls. Here are a court house, numerous churches, West High School, Collegiate Institute, Conservatory of Music, School for Stammerers, waterworks, street railroads, electric lights, National and other banks, and several daily, weekly, and monthly periodicals. The city has flour mills, foundries, woolen mills, and manufactures of farming implements, furniture, electric cars, gasoline engines, locomotives, paper, machinery, etc., and an assessed property valuation of nearly $2,500,000. Pop. (1900) 12,580; (1910). 26,693.

**Waterloo,** a village and one of the county-seats of Seneca co., N. Y.; on the Seneca river, the Cayuga and Seneca canal, and the New York Central railroad; 17 miles W. Auburn, 58 miles E. of Rochester. It has woolen, saw and flour mills, wagon and piano factories, National and State banks. Pop. (1900) 4,256.




NOTE.— The village of Waterloo is about a mile N. of Mont St. Jean.

**Waterloo, Battle of,** an important battle won by the allied forces over Napoleon, near Waterloo, a Belgian village 11 miles S. of Brussels, June 18, 1815. The preliminary battles had been at Ligny, June 16 (when Napoleon had defeated the Prussians under Blücher), and at Quartre-Bras, on the same day (when the allies under Wellington compelled the French Marshal Ney to retire). At Waterloo the French numbered about 72,000. The allies (British, Dutch, and Germans), under Wellington, had about 67,000; the Prussians (about 50,000 more), under Blücher, came up in time to take part in the close of the battle, and in the pursuit. The battle began about 11:30 A. M. Briefly it may be said to have consisted of a series of brilliant but unsuccessful charges made by the French, and dogged resistance on the part of the British; in the evening the French Old Guard charged, but unavailingly; after which the allies advanced. The French lost about 35,000, and many prisoners; the allies about 22,000. Marshal Grouchy, though he defeated Blücher at WAVRE (*q. v.*), June 18, failed to prevent him from joining Wellington, and himself failed to come to Napoleon's aid, though but a few miles distant. The rout of the French was complete, and the disaster final to Napoleon, the result being his deposition and exile to St. Helena.

**Waterloo, Stanley,** an American author; born in St. Clair co., Mich., May 21, 1846. Was graduated at the University of Michigan in 1869. Was editor of St. Louis "Journal," and Chicago "Tribune"; later editor-in-chief of the Chicago "Mail" and other papers. He wrote: "A Man and a Woman"; "The Story of Ab"; "The Seekers"; "Honest Money," etc.

**Waterman, Thomas Whitney,** an American lawyer; born in Binghamton, N. Y., June 28, 1821; was educated at Yale University, and admitted to the bar in 1848; followed his profession in New York city till 1870, and then settled in Binghamton, N. Y. He was the editor of "New System of Criminal Procedure"; "Murray Hoffman's Chancery Reports"; etc., and author of "Treatise on the Civil and Criminal Jurisdiction of Justices of the Peace for the tion of Justices of the Peace for the States of Wisconsin and Iowa, Containing Practical Forms"; "Digest of the Reported Decisions of the Superior Court and of the Supreme Court of Errors of the State of Connecticut from the Organization of Said Courts to the Present Time"; and other works of a similar nature. He died in Binghamton, N. Y., Dec. 7, 1898.

**Water Mark**, in ordinary language, the mark or limit of the rise of a flood; the mark indicating the rise and fall of the tide. In paper making, any distinguishing device or devices indelibly stamped in the sub-

stance of a sheet of paper while yet in a damp or pulpy condition. The device representing the water mark is stamped in the fine wire gauze of the mold itself. The design is engraved on a block, from which an electrotype impression is taken; a matrix, or mold, is similarly formed from this. These are subsequently mounted on blocks of lead or gutta-percha, to enable them to withstand the necessary pressure, and serve as a cameo and intaglio die, between which the sheet of wire gauze is placed to receive an impression in a stamping-press. The water marks used by the earlier paper-makers have given names to several of the present standard sizes of paper, as pot, foolscap, crown, elephant, fan, post.

**Water Meadow,** a meadow capable of being kept in a state of fertility by being flooded with water at certain seasons from an adjoining stream. Generally applied to meadows intersected by channels, which, by means of dams, can at any time be made to overflow the land.

**Water Measure,** a measure formerly in use for articles brought by water, as coals, oysters, etc. The bushel used for this purpose was larger than the Winchester bushel by about three gallons.

**Water Melon,** the *Citrullus vulgaris.* The leaves are deeply lobed and gashed; the fruit large, round, with a spotted rind; cold, watery, pink or white flesh, and black seeds. It is cultivated in the United States, India, China, Japan, the Eastern Peninsula, Egypt, etc., for its juice, which is cool and refreshing, but somewhat insipid, and as a dessert. It is the melon of Scripture.

**Water Meter,** a contrivance for measuring the amount of water received or discharged through an orifice. There are numerous varieties. Also an instrument for determining the amount of water evaporated in a given time, as from a steam boiler.

**Water Mice,** the genus *Hydromys*, sometimes elevated to a sub-family (*Hydromyinæ*). The species are small rat-like animals of slender form, with long tails and short limbs; toes partially webbed.

**Water Mint,** the *Mentha aquatica,* a mint having the leaves ovate, serrate, stalked, the flowers dense in terminal obtuse heads or spikes, or sometimes in remote axillary whorls. It is frequent by the side of rivers and marshes.

**Water Ousel,** a European bird of the thrush family, generally of a dark-brown color, with throat and upper part of the breast pure white. It frequents clear, pebbly streams and lakes, feeding chiefly on mollusks, and on aquatic insects and their larvæ, which it seeks even under water, diving with great facility, and moving about for a short time at the bottom of the river. It carries its rather short tail elevated after the manner of wrens, which it also resembles in its frequent becks, or dipping of the head, accompanied with an upward jerking of the tail.

**Water Oven,** in chemistry, an apparatus employed for drying substances, at or near the temperature of boiling water, without the vessel containing them coming in contact with the vapor of water, as in the case of the open water bath. It consists usually of an oblong copper vessel, surrounded with a jacket of the same metal, the intervening space being nearly filled with water, which is kept continuously at the boiling point by means of a gas-burner placed under the apparatus. The steam generated in the interior is condensed by passing through a lengthened vertical pipe, by means of which the water again returns to the vessel. If it is desired to attain a heat rather over 100°, a little salt is dissolved in the water contained in the apparatus.

**Water Pipit,** in ornithology, *Anthus spipoletta,* a native of the center and S. of Europe, N. Africa, ranging into Asia as far as China. It is about seven inches long; plumage grayish-brown above, slightly mottled with darker streaks along the middle of each feather; warm vinaceous buff on throat and breast, becoming lighter on belly.

**Water Pitcher,** the popular name of plants of the order *Sarraceniaceæ*, the leaves of which somewhat resemble pitchers or trumpets in general form.

**Water Plantain,** the common name of various species of plants of the genus *Alisma*, natural order *Alismaceæ.* One species, *A. Plantago* (great water plantain), is a common wild plant in wet ditches and by river sides.

**Water Power,** a general phrase applied to the various means by which the energy of moving water may be utilized. To make such a source of energy effectual, it is necessary and sufficient to have the water falling from a higher to a lower level; in other words, the water must have what is technically called a "head." Such conditions more or less favorable exist in all streams, though in many cases the fall is so slight and therefore the velocity of the water so small that practically no useful work can be obtained. In such case, by the construction of dams or otherwise, the energy may be stored up as potential energy in a large mass of water to be transformed at will. Even where the stream is one which is directly available for performing useful work, it is usually advisable to collect the water in reservoirs, since the quantity of flow of most streams varies considerably with the seasons. Even with

such precautions the supply of water may be far from uniform, overflowing the dams in the wet season and hardly filling them in the dry weather.

Given the available fall and the total quantity of water which flows in a given time, the potential energy which is lost is expressed in foot pounds by the product of the mass in pounds multiplied by the height through which the water has fallen. This energy is mainly transformed into the kinetic energy of running water, while part is transformed into heat and sound. If the former portion could be wholly transformed into useful work, the water would be brought to rest; but as this is never practically realized, we see that the available energy of a fall of water is much smaller than the total transformable energy.

Of the various machines by which the necessary transformation is usefully effected, the most common are what are known as water wheels, in their several forms of turbines, undershot wheels, breast wheels and overshot wheels. The last three are very similar in construction, and are made to rotate round a horizontal axis by the action of the water on the floats which are fixed at equal intervals more or less radially round the circumference of the wheel.

In the overshot wheel, which is applicable to falls of from 12 to 60 feet, the water is received in the bucket-shaped partitions in the circumference, and by its weight, aided in some measure by the initial impact, drives the wheel round, the upper part moving in the direction of the flow of water. The water escapes below as each partition during the rotation of the wheel is turned face downward. The breast wheel acts very similarly, and is applicable to falls smaller than those for which the overshot wheel can be conveniently used. The upper circumference of the wheel is higher than the feeding channel of the water, which enters at a point usually a little above the center of the wheel. The undershot wheel is used where the momentum only of the current can be utilized, the impact of the water upon the floats forcing the wheel round. There is necessarily a considerable waste of power in the undershot wheel, which was to a certain extent remedied by Poncelet when he introduced curved instead of plane floats.

The turbine or vortex wheel is usually horizontal, rotating round a vertical axis. In the original form of turbine, invented by Fourneyron in 1823, water was introduced from above into a central chamber, from which it radiated through curved radial chambers. From these it was projected on the curved floats of the wheel, which was forced round by the reaction of the escaping water. The principle of the action is the same as that of Barker's mill. In all forms of turbines the essential parts are — (1) fixed vanes, called guides, for giving direction to the water; (2) vanes at the circumference for receiving the water; (3) a gate for regulating the quantity of water, and therefore the velocity of the wheel; and (4) a shaft for transmitting the rotatory motion. Besides the outward-flow turbines, like that described above, in which the guides are inside the wheel, there are also inward-flow turbines, which have the guides outside, and the parallel-flow turbines, in which the guides are above the wheel. In the turbine both the direct implse and the reaction of the water are utilized; and in this way the turbine had decided advantages over other forms of water wheels.

Though it is from rivers and streams that we derive all the water power which is profitably used, there is no doubt that in the tides we have a great and remarkably constant source of energy, if it could be utilized. Suggestions have not been wanting as to methods for utilizing this energy, but as yet nothing practical has resulted.

**Waterproof Cloth,** cloth rendered impervious to water. There are numerous processes for waterproof fabrics of all kinds. The earliest patent, that of Macintosh (1823), consisted in covering cloth with a paste obtained by dissolving caoutchouc in benzol or coal naptha. In the treatment of cotton and linen cloth a small proportion of sulphur is generally added. A thin layer of this rubber solution is spread on the fabric by special machinery, after which the cloth is doubled, pressed, and finished in calenders, the waterproof layer being thus in the center of the finished material. Textiles thus manipulated become also impervious to air, and from a hygienic point of view unsuitable for prolonged personal wear. This led to the introduction of other solutions and methods of application intended to produce fabrics, which, while resisting rain, do not altogether obstruct ventilation. Consecutive dipping of cloths in soap and alum solutions, or in gelatine and gall solutions, or in a solution of acetate of lead and then in a solution of alumina, has been resorted to with more or less success. The substance called ALGIN (*q. v.*) obtained from the seaweed, has been strongly recommended for the same purpose. Another recent patent process consists in treating the fibers in the solution instead of the manufactured textile, and the fabric thus produced, while rain resisting, offers the same ventilation as ordinary materials.

**Water Rabbit,** the *Lepus aquaticus*, an American species, most abundant in the swampy tracts bordering on the Mississippi and its tributaries in the Southwestern States, whence it is also called the swamp hare. It is an excellent swimmer, and subsists chiefly on the roots of aquatic plants.

Fur dark grayish-brown above, white below, coarse in texture; ears and tail long.

**Water Radish,** the *Nasturtium amphibium*, an aquatic plant, two to four feet high, with pinnatifid leaves and yellow flowers, growing in wet places, and flowering from June to September.

**Water Rail,** in ornithology, the *Rallus aquaticus*, generally distributed over America and Europe, and fairly common, though not often seen, from its shy, retired habits. The male is about 11 inches in length, female somewhat smaller; general plumage brown, streaked with black; lores and eyebrows, sides of face, and underparts slaty-gray. It frequents marshes and bogs, and swims and dives well, but is bad on the wing. It is a delicious bird for the table.

**Water Rattle,** the *Crotalus adamanteus*, the diamond rattlesnake. It sometimes reaches eight feet in length; yellowish-brown with dark brown spots, belly yellowish, tail black or barred with black. Found in damp and shady places from North Carolina to Texas, and varieties of it range into California and Mexico. It is exceedingly poisonous.

**Waters, Clara Erskine (Clement),** an American author; born in St. Louis, Mo., Aug. 26, 1834. In 1883–1884 she made a tour round the world. The first of her many publications was the "Simple Story of the Orient" (1869). "Legendary and Mythological Art" (1871); "Artists of the Nineteenth Century and their Works," with Laurence Hutton (1879); "Eleanor Maitland," a novel (1881); "Painters, Sculptors, Architects, Engravers, and Their Works" (1882); "Stories of Art and Artists" (1886); "Angels in Art"; "Saints in Art"; and a translation of "Dosia's Daughter," a novel by Henri Gréville, are included in her works.

**Water Scorpion,** the popular name of *Nepa*, a genus of hemipterous insects, the species of which inhabit ponds, etc. Some of them are powerful insects, two or three inches in length. They receive their popular name from the scorpion-like form of the forelegs, with which they seize their prey.

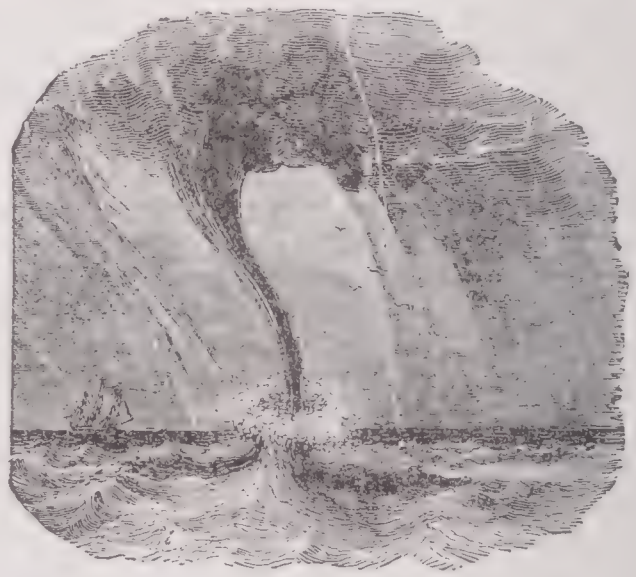
**Water Shell,** in ordnance, a common shell or cast-iron cylinder filled with water, into which is fitted a small cylinder containing a quarter, or, at the most, half an ounce of gun cotton; it is then hermetically sealed; a few grains of fulminate of mercury are placed between the gun cotton and the fuse, and, as soon as the latter is fitted, the shell is ready for firing.

**Water Shrew,** the *Crossopus fodiens*, common over the continent of Europe as far N. as the Baltic, found in many parts of Great Britain, but not known to occur in Ireland. About three inches long, tail two inches; generally black above and white beneath; but there is great variation in the color of different specimens, some of which have been described as distinct species.

**Water Soldier** (*Stratiotes aloides*), a plant belonging to a genus of the natural order *Hydrocharideæ*, is common in lakes and ditches in the E. of England. It is a singular plant with numerous leaves, which are strap-shaped and spring from the root, from which also springs the two-edged flower-stem, bearing the spathe with beautiful and delicate white flowers. In autumn the whole plant disappears, the root alone remaining at the bottom of the water, from which a number of young plants arise in spring, filling up ditches, so that nothing else can grow in them. The water soldier is a very ornamental aquatic plant.

**Water Spirit,** in anthropology, a spirit supposed to reside in lakes, rivers, and the sea. Water spirits were believed to be the active agents in all cases of drowning and shipwreck, and to avenge the rescue of drowning persons on their rescuers. Hence arose the wide-spread superstition that it was unlucky to save a shipwrecked person or one who had fallen into the water. The belief in water spirits was almost universal at an early stage of culture, and still lingers in a poetic form on the banks of the Rhine.

**Waterspout,** a remarkable phenomenon occurring for the most part at sea, but occasionally on land, though generally in this



A WATERSPOUT AT SEA.

latter case in the neighborhood of water. A waterspout at sea is usually formed in the following manner: A dense cloud projects from its center a body of vapor, in form something like a sugar loaf with the point downward. This cone is agitated by the wind till it assumes a spiral form, and gradually dips more and more toward the sea, where a second cone is formed having its point upward. The clouds above and the water below are violently agitated by the physical influences at work. Suddenly

the descending and ascending cones of water or vapor meet in mid-air, and form one united pillar which moves onward vertically in calm weather, but obliquely to the horizon when acted on by the wind. The junction of the two cones is generally accompanied by an electric flash. After continuing in this form for a short time the waterspout bursts, in some cases with terrific violence, and to the destruction of anything in the vicinity. Many a ship has been overwhelmed in this manner, and sunk in a moment with all on board. In November, 1855, five vessels were destroyed by a waterspout in the harbor of Tunis. Waterspouts on land are cones or pillars of vapor descending from the clouds. Land waterspouts are usually very destructive in their effects. On Aug. 30, 1878, the town of Miskolcz, in Hungary, was destroyed by a waterspout with considerable loss of life. These phenomena are, however, more common in India than in Europe. One which occurred at Dum-Dum, near Calcutta, was ascertained to be 1,500 feet in height, and it deluged half a square mile of territory to a depth of six inches.

The cause of these phenomena has been assumed to be (1) electricity; (2) vortical motion; or (3) a combination of these causes. M. Weyher has, however, succeeded in producing them artificially, and his method shows that vortical motion is the great factor in the production of waterspouts. By means of a rotating tourniquet placed over cold water, an aërial eddy is caused which draws up the water, in the form of a spout composed of drops, to a considerable height; when the water is heated a clearly defined waterspout is seen. With from 1,500 to 2,000 rotations per minute, the vapor from heated water condenses into a visible sheath, enveloping a clearly-defined and rarefied nucleus, conical, and tapering downward. As in natural marine spouts, water drops are carried up and thrown out beyond the influence of the upward current.

**Water Table,** in architecture, a projecting stone sloped on the roof to throw off water. It occurs in buttresses and other parts of Gothic architecture.

**Water Thermometer,** an instrument in which water is substituted for mercury, for ascertaining the precise degree of temperature at which water attains its maximum density. This is at 39.2° F., or 4° C., and from that point downward to 32° F., or 0° C., or the freezing point, it expands, and it also expands from the same point upward to 212° F., or 100° C., or the boiling point.

**Waterton, Charles,** an English naturalist; born in Walton Hall, Wakefield, England, in 1782. He was educated at the Roman Catholic College at Stonyhurst, where he evinced a great taste for natural history. He spent many years in travel, and published "Wanderings in South America" and "Essays in Natural History," with an "Autobiography." He died in 1865.

**Watertown,** a city and county-seat of Jefferson co., N. Y.; on the Black river, and on the Rome, Watertown and Ogdensburg railroad; 69 miles N. of Syracuse. The river here has rapids and falls which furnish good water power and is spanned by a number of bridges. The city contains the Convent of the Immaculate Conception, Irving School, a high school, State armory, Henry Keep Home for the Aged, business college, Orphans' Home, public library, public park, National and savings banks, electric street railroads, electric lights, and daily, weekly, and monthly periodicals. It has manufactories of machinery, sleighs, electrical apparatus, furniture, printing presses, agricultural implements, air and vacuum brakes, carriages, wagons, woolen goods, paper, thermometers, lamps, tinware, spirit levels, etc. and an assessed property valuation of over $9,500,000. Pop. (1900) 21,696; (1910) 26,730.

AFRICAN WATER TURKEY.

**Watertown,** a city in Dodge and Jefferson cos., Wis.; on the Rock river, and on the Chicago and Northwestern, and the Chicago, Milwaukee, and St. Paul railroads; 45 miles W. by N. W. of Milwaukee. Here are the Northwestern University (Luth.), the Sacred Heart University (R. C.), a high school, several churches, libraries, electric lights, National and State banks, and daily and weekly newspapers. Watertown is an important barley and cheese market, and has a shoe factory, foundry, breweries, brass

works, mills, etc. Pop. (1890) 8,755; (1900) 8,437; (1910) 8,829.

**Water Turkey,** the *Plotus anhinga*. According to Ripley and Dana, this bird is a constant resident in Florida, and the lower parts of Louisiana, Alabama, and Georgia; in spring it goes up as far N. as North Carolina, breeding along the coast; in these various localities it bears the name of water crow, Grecian lady, water turkey, and cormorant.

**Water Vascular,** in biology, a term applied to a system of canals, in the *Annuloidea*. They communicate with the exterior, and open internally into the perivisceral cavity. Their function is not certainly known, but they are probably excretory and respiratory.

**Waterville,** a village in Kennebec co., Me.; on the Kennebec river, and on the Maine Central railroad; 18 miles N. of Augusta. Here are COLBY COLLEGE (*q. v.*), Coburn Classical Institute, high school, several libraries, waterworks, street railroad and electric light plants, National and savings banks, and a number of daily, weekly, and monthly periodicals. The city contains the car and locomotive works of the Maine Central railroad. It also has pulp, paper, and cotton mills, sawmills, plow, axe, hoe, and scythe factories, machine shops, tanneries, etc., and an assessed property valuation of nearly $5,000,000. Pop. (1890) 7,107; (1900) 9,477; (1910) 11,458.

**Water Vine,** in botany, the *Phytocrene gigantea*, a large climber occurring in Martaban. The wood, which is soft and porous, discharges when wounded a quantity of pure, tasteless, and wholesome fluid, drunk by the natives. Also the *Tetracera potatoria*, a climber about 20 feet long, with yellow flowers. A native of Sierra Leone.

**Watervliet,** a city in Albany co., N. Y.; on the Hudson river, the Erie canal, and the Delaware and Hudson railroad; opposite Troy. Prior to 1896 it was known as the village of West Troy. Here are the famous Watervliet Arsenal, founded in 1807 by the United States government, street railroads, electric lights, numerous churches, a National bank, and a weekly newspaper. The arsenal plant contains extensive foundries, and shops for the manufacture of siege, coast defense, and field guns, shot and shell, gun carriages, and small ammunition. The city also has large car works, and an extensive and noted bell foundry. The assessed property valuation exceeds $4,600,000. Pop. (1900) 14,321; (1910) 15,074.

**Water Vole,** the *Arvicola amphibius*, popularly known as the water rat. It is a small rodent, about a foot long, of which the tail occupies nearly five inches. Fur thick and shining, rich reddish-brown above, yellowish-gray beneath. These animals haunt the banks of rivers and ponds, and, though the feet are not webbed, swim with facility not only on the surface, but below the water. They have been accused of destroying fish spawn, and feeding on young fish and even on ducklings, but the charge is probably unfounded, as their food appears to be entirely vegetable. Common in England, throughout Europe and Asia, to China.

**Water Wagtail,** in ornithology, the pied wagtail, *Motacilla lugubris*, a well-known European bird. Length, about seven inches; forehead, cheeks, sides of neck, and lower parts pure white; back and sides ash color, the rest black; wing coverts black, bordered with white, two outer tail feathers white. In winter the black patch on throat is diminished to a circlet. Also (plural) any species of the genus *Motacilla* as distinguished from *Budytes*.

**Waterways,** strong pieces of planking which extend around a ship at the junction of the decks with the sides, to prevent the water entering between the edge of the deck and the ship's sides; and also to counteract any tendency in the beams to slip upward.

**Water Wheel.** See TURBINE: WATER POWER.

**Water Worship,** a branch of NATURE WORSHIP (*q. v.*), formerly common among Aryan nations, and still practised by races of low culture. No race seems to have risen to the abstract conception of water as an element, but seas, rivers, and lakes were all separately worshiped.

**Watery Flounder,** a popular name for the American or spotted turbot, *Rhombus maculatus*. It is from 12 to 18 inches long, and resembles the brill more than any other European fish. It occurs along the coast of New England and the Middle States, and is excellent eating.

**Watery Gripes,** a popular designation for a form of serous diarrhœa, occurring in infants, the discharges being copious, thin, watery, often nearly colorless, and occasionally intermixed with flakes or shreds. Owing to the severity of the symptoms, and the rapidity of action, the disease is sometimes called cholera infantum, and there is some reason for the designation, as the malady is very dangerous, and often rapidly fatal. Watery gripes may be caused by sudden impressions of cold on the surface, or by cold drinks taken when the body is heated, and also by exposure to air contaminated with the products of decomposition. The first thing to do in a case of infantile diarrhœa is to produce evacuation of the bowels by means of a small dose of castor oil with a few drops of tincture of opium, and the child should be wrapped up in warm flannel, and hot flannel cloths should be kept constantly applied over the abdomen. A few grains of Dover's powder,

or aromatic powder of chalk and opium, according to the age of the child, may be given. Extract of hæmatoxylon is probably the best astringent that can be given, and tincture of red gum is also serviceable.

**Watkin, Sir Edward William,** an English railway manager; born in Northenden, Cheshire, England, in 1819. He was engaged in his father's London warehouse from the time he was 10 years old, till 1845, when he was appointed secretary to the Trent Valley Railroad Company. From this post he came by stages to be general manager of the London and Northwestern Company, director and chairman of the Manchester, Sheffield, and Lincolnshire Railway, president of the Grand Trunk Railway of Canada, chairman of the South Eastern, and director of the Great Western and Great Eastern Companies. While he was president of the Canadian road he undertook, at the instance of the Duke of Newcastle, negotiations with the five British North American provinces, which resulted in the passage of the Confederation Act and the establishment of the union between the provinces. For this service he was knighted. Subsequently he was made a baronet, in consideration "of the services he has rendered in the development of commerce and the railroad industries in the United Kingdom and the colonies." At one time during the negotiations with the provinces the Duke of Newcastle, for the government, refused to ratify on behalf of the government the purchase of the Hudson Bay Territory. For a time it looked as though the negotiator would have that expanse of territory on his own hands. Sir Edward was a member of Parliament after 1857, during late years for Stockport and Hythe. He was intimate with Disraeli, Cobden, and Salisbury, and had been a friend to Dickens. He died in London, April 14, 1901.

**Watkins, John Elfreth,** an American scientist; born in Ben Lomond, Va., May 17, 1852; was graduated at Lafayette College in 1871; was mining engineer for the Delaware and Hudson Canal Company in 1871–1872. He was curator of the United States National Museum in 1877–1892, and was made superintendent and curator of its technological collections in 1895. His publications include "History of the Pennsylvania Railroad, 1846–1896"; "The Evolution of the Railway Passenger Car" (1888); and many papers on the evolution of the telegraph, railroads, etc. He died in 1903.

**Watkins' Glen,** a remakable ravine and pleasure resort near the head of Seneca Lake in the W. central part of New York. It has become famous owing to its attractive scenery, which draws thousands of visitors each year. The rocks consists of Devonian shale, which during the Pleistocene period were here cut into deep narrow gorges by the glacial ice. These gorges contain numerous cataracts and have steep, smooth walls.

**Watling's Island,** a small island in the Bahama group, West Indies. It is 18 miles long, and has a lake in its center. It is supposed to be the first land in the New World seen by Columbus, generally known as San Salvador.

**Watling Street,** one of the great Roman highways of Britain, commencing at Dover, passing through Canterbury and Rochester to London, and thence to Chester and York, and N. in two branches to Carlisle and the Wall in the neighborhood of Newcastle. Traces of the ancient road are still to be found in many parts of its course, and in some it is still an important highway; a street in London retains its name. It was the line of division in the treaty between Alfred and Guthrum the Dane, and it is still the boundary between Warwickshire and Leicestershire. Of the "Waetlings" nothing is now remembered. Perhaps a trace also survives in the name Wattlesborough, a place on Watling street near Wroxeter (Uriconium).

**Watson, George Lennox,** an English naval architect; born in Glasgow, Scotland, Oct. 30, 1851; received a collegiate education, learned the trade of shipbuilding; and in 1872 began business in Glasgow as a naval constructor. He became widely known in 1880 as the builder of the yacht "Vanduara," which out-classed the Prince of Wales' celebrated yacht "Formosa." In 1887 he built the "Thistle" and later the "Valkyrie II." and "Valkyrie III." to compete for the "America" cup. In 1893 he designed the "Britannia" for the Prince of Wales, a yacht said to be the fastest racer in the world. In all he designed over 400 vessels, including steam yachts, cargo, and mail steamers, etc. He died Nov. 12, 1904.

**Watson, Henry Clay,** an American journalist; born in Baltimore, Md., in 1831. He was the author of: "Camp-Fires of the Revolution" (1851); "Nights in a Block-House" (1852); "Old Bell of Independence" (1852); "The Yankee Teapot" (1853); "Heroic Women" (1853); "The Masonic Musical Manual" (1855); "Camp-Fires of Napoleon" (1856); and "Lives of the Presidents" (1858). He died in Sacramento, Cal., July 10, 1869.

**Watson, James Craig,** an American astronomer; born in Ontario, Can., Jan. 28, 1838; was graduated at the University of Michigan at the age of 19, and appointed Professor of Astronomy in that institution at the age of 21; called to the chair of astronomy in the University of Wisconsin in 1879. He was the discoverer of 23 asteroids, and received the Lalande medal of the

Paris Academy of Sciences for the discovery of six of them in one year. He was a member of the Eclipse Expeditions to Iowa in 1869 and to Sicily in 1870, and took charge of the Transit of Venus Expedition to Peking, China, in 1874. He was also the discoverer of several comets. He was for many years the actuary of an insurance company, and accumulated a moderate fortune by commercial enterprises, of which he left $16,000 to the National Academy of Sciences, the income of which is partly devoted to a research fund and partly to the bestowal of the "Watson Medal" of the Academy. His most lasting work was the writing of his "Theoretical Astronomy," a standard work on the computation of orbits and the theory of perturbations. He died in Madison, Wis., Nov. 23, 1880.

**Watson, John,** pseudonym IAN MACLAREN, an English clergyman and author; born in Manningtree, Essex, England, Nov. 3, 1850; was graduated at Edinburgh University (1870); studied theology at New College, Edinburgh, and Tübingen; ordained minister of the Free Church, Logiealmond, Perthshire (1875); called to Free St. Matthew's, Glasgow (1878); translated in 1880 to Sefton Park Church, Liverpool, one of the most important congregations of the Presbyterian Church of England; received Hon. D. D. in 1895 from St. Andrews University, and a similar degree in 1897 from Yale University, where he lectured on preaching (1896). Till 1893 Dr. Watson was known as a popular preacher and able minister; but in that year he acquired additional distinction and wider fame by writing a series of Scotch idylls for the "British Weekly." When collected and published in book form under the title of "Beside the Bonnie Brier Bush," they became widely popular in Great Britain and the United States. "The Days of Auld Lang Syne," a second series of idylls, published in 1895, also reached a large circulation. Dr. Watson's religious publications include: "The Upper Room"; "The Mind of the Master" (1896); "The Cure of Souls"; "The Potter's Wheel" (1897); "Companions of the Sorrowful Way" (1898). A novel, "Kate Carnegie and Those

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Watson

Ministers," was published in 1896. He died in Mt. Pleasant, Ia., May 6, 1907.

**Watson, John Crittenden,** an American naval officer; born in Frankfort, Ky., Aug. 24, 1842; was graduated at the United States Naval Academy in 1860; in 1861 promoted to master and attached to the "Sabine"; in 1862 transferred to Farragut's flagship, the "Hartford," on which he served through the war, being in the battles at Fort Jackson and St. Philip, the passage of the Vicksburg batteries in 1862, passage of Port Hudson in 1863, and at Mobile Bay in 1864. During the latter engagment Admiral Farragut took up his position in the port-mizzen rigging, the better to observe the progress of the fight. Lieutenant Watson, seeing the danger to which he was exposed, procured a rope and lashed him to the rigging.

Watson was commissioned Lieutenant-Commander in 1866 and assigned to the "Franklin" flagship of the European squadron. In 1869 he was assigned to duty at Philadelphia till 1870, transferred to the Asiatic squadron till 1873, was made Commander in 1874, attached to the Mare Island navy yard till 1877, commanded the "Wyoming" till 1880, lighthouse inspector till 1886, attached to the navy yard at New York till 1887, promoted captain in March, 1887, transferred to San Francisco till 1890, and made commodore Nov. 7, 1897. In the American-Spanish War he commanded the blockading squadron on the N. Cuban coast, and organized a fleet which it was said was intended to operate against the coast cities of Spain. In 1899 he succeeded Admiral Dewey in command of the Asiatic squadron at Manila. Rear-Admiral 1899; retired 1904.

**Watson, John Whittaker,** an American journalist and poet; born in New York city, Oct. 14, 1824. He wrote many stories for periodicals, and was one of the many alleged authors of the poem, "Beautiful Snow," contained in "Beautiful Snow and Other Poems" (1869). He died in New York July 18, 1890.

**Watson, Paul Barron,** an American lawyer and historian; born in Morristown, N. J., March 25, 1861; was graduated at Harvard in 1881; practised law in Boston, Mass. He published: "Bibliography of the Pre-Columbian Discoveries of America" (1881); "Life of Marcus Aurelius" (1884); and "The Swedish Revolution under Gustavus Vasa."

**Watson, Rosamund Marriott,** an English poet, writing sometimes under the pseudonyms GRAHAM R. TOMSON and R. ARMYTAGE; born in London, England, in 1863. She contributed to English and American periodicals, and edited several anthologies. Her works include: "The Bird Bride" (1889); "A Summer Night, and Other Poems" (1891); "After Sunset" (1895).

**Watson, Thomas,** an English poet; born in London, about 1557. His poems, pastoral and amatory, equaled in popularity those of his friends Spenser and Sidney. He translated Sophocles' "Antigone" into Latin (1581); and wrote: "Ekatompathia, or Passionate Centurie of Love" (1582); "Melibœus," an elegy on the death of Sir Francis Walsingham (1590); "The Tears of Fancie, or Love Disdained" (1593), and many other works. He died in 1592.

**Watson, Thomas Edward,** an American lawyer, politician, and author; born in Columbia co., Ga., Sept. 5, 1856; received a common school and high school education, and entered Mercer University in 1872, where he studied two years. He took up the study of law and was admitted to the bar in 1875. Beginning the practice of his profession at Thomson, Ga., he soon won a place among the leading lawyers of the State. In 1882 he was elected to the Georgia legislature as a Democrat, and in 1888 served as Democratic presidential elector at large. Active participation in the Farmers' Alliance movement led him to affiliate himself with the People's party, on whose ticket in 1890 he was elected to Congress. In 1893 he secured the first appropriation for rural free delivery of mail ever passed by Congress. He was nominated for vice-president by the People's party in 1896, and in 1904 became the candidate of that party for the presidency. In 1905-06 he edited "Tom Watson's Magazine" in New York city. In 1906 he established in Atlanta "Watson's Jeffersonian Magazine." His works include: "The Story of France" (1898); "Life of Thomas Jefferson" (1900); "Life of Napoleon" (1902); "Life and Times of Thomas Jefferson" (1903); and "Bethany, a Study and Story of the Old South" (1904).

**Watson, William,** an English poet; born in Burley-in-Wharfedale, Yorkshire, Aug. 2, 1858. His published works include: "The Prince's Quest" (1880); "Epigrams of Art, Life, and Nature" (1884); in the "National Review," a series of political sonnets, "Ver Tenebrosum" (1885); "Wordsworth's Grave, and Other Poems" (1890); "Lachrymæ Musarum" (1892), a eulogy of Tennyson; "The Eloping Angels" (1893); "Excursions in Criticism" (1893); "Odes, and Other Poems" (1894); "The Purple East" (1896); "The Year of Shame" (1896); "The Hope of the World" (1897); "Collected Poems" (1898); "For England"; "Selected Poems"; and "The Woman with the Serpent's Tongue" (1909), which created much excitement in English political and social circles.

WILLIAM WATSON

**Watson, William,** an American scientist; born in Nantucket, Mass., Jan. 19, 1834; was graduated at the Lawrence Scientific School, Harvard, in 1857; professor of mechanical engineering and descriptive geometry in the Massachusetts Institute of Technology in 1865-73; and became secretary of the American Academy of Arts and Sciences in 1884.

**Watt** (named in honor of James Watt), the practical electrical unit of activity or rate of doing work. It is measured by the product of the voltage or electro-motive force of the source into the current supplied. Thus a dynamo which is yielding 30 amperes at a voltage of 100 is working with an activity of 3,000 watts. The watt is equal to 0.735 foot-pound per second; so that one horse power per second is equal to 746 watts. It is customary to use the kilowatt, equal to 1,000 watts. See ELECTRICITY; UNITS, ELECTRICAL; VOLT.

**Watt, James,** a British inventor; born in Greenock, Scotland, Jan. 19, 1736. His father was a merchant and magistrate of Greenock, and James received a good education in its public schools. Having determined to adopt the trade of mathematical instrument maker, he went to London (1754) to learn the art, but ill-health compelled him to return after only a year's apprenticeship. Shortly after his return he endeavored to establish himself in Glasgow. The corporation objecting, he was appointed in 1757 mathematical instrument maker to the university, and resided within its walls till 1763, when he removed into the town. From this time till 1774 he acted as a civil engineer—made several surveys for canals and harbors, and some of his plans were afterward carried into execution. It was during this period that he conceived and gave shape to his improvements on the steam engine, which have rendered his name famous (see STEAM ENGINE). To give his inventions practical form he associated himself in 1769 with Matthew Boulton (*q. v.*) in the firm of Boulton & Watt, having their works at Soho, near Birmingham. He retired from business in 1800.

Watt was a fellow of the Royal Societies of London and Edinburgh, and member of the National Institute of France. He was twice married, and was survived by one son, who carried on the establishment at Soho in partnership with a son of Boulton. Besides improving the steam engine,

Watt invented or improved a variety of mechanical appliances, including a letter-copying press. He was a man of high mental powers generally, and possessed a wide and varied knowledge of literature and science. He died in Heathfield, Staffordshire, Aug. 25, 1819.

**Watt, Robert,** a Scotch bibliographer and physician; born near Stewarton, Ayrshire, Scotland, in May, 1774; studied for the Church at Glasgow University (1793–1797); subsequently studied medicine at Edinburgh, and was licensed in surgery and pharmacy, which arts he practised in Paisley and in Glasgow (1799–1817). He was a distinguished physician, accoucheur, and lecturer on the practice of medicine at Glasgow. He wrote medical works on diabetes, consumption, and whooping-cough, and a moral work, "Rules of Life"; but he is best known by his valuable (though far from complete or infallible) "Bibliotheca Britannica" (4 vols. 4to. 1824); which originated in a catalogue (published 1812) of a library he gathered for the use of his students. He died in Glasgow, Scotland, March 12, 1819.

**Watteau, Jean Antoine** (vä-tō′), a French painter; born in Valenciennes, France, Oct. 10, 1684. In 1702 he went to

JEAN ANTOINE WATTEAU.

Paris, and earned his bread by working for decorative painters. For many years he struggled in obscurity, but his talent once recognized, he rapidly became popular and prosperous. In 1717 he was received at the Academy, and enrolled as a painter of *fêtes galantes*, that is, pleasure parties, balls, masquerades, etc., subjects in which he excelled. Lightness, elegance, and brilliancy form the chief attractions of his style. He died in Nogent-sur-Marne, July 18, 1721.

**Wattenbach, Wilhelm** (vät′ten-ba*h*), a German historian and palæographer; born in Ranzau, Holstein, Sept. 22, 1819; became Professor of History at Heidelberg, 1862, and 1873 in Berlin University. He was author of "Contributions to the History of the Christian Church in Bohemia and Moravia" (1849); "Introduction to Greek Palæography" (1867); "Introduction to Latin Palæography" (1869); "Writing in the Middle Ages" (1871); "Vacation Travels in Spain and Portugal" (1869); "The Transylvanian Saxons" (1870); "The Inquisition against the Waldenses in Pomerania and in the Mark of Brandenburg" (1886); "The Sect of the Brethren of the Free Spirit" (1887); "History of the Roman Papacy" (1876). He died in Frankfort, Sept. 20, 1897.

**Watterson, Henry,** an American journalist; born in Washington, D. C., Feb. 16, 1840. His first work as journalist was with the "Democratic Review," and "The States," in Washington, D. C. He edited the "Republican Banner," Nashville, Tenn., before and after the Civil War, in the interim serving with distinction in the Confederate army. He edited, in Louisville, Ky., the Louisville "Journal" (1867–1868); and the Louisville "Courier-Journal" since 1868. He published: "History of the Spanish-American War" (1899); "Abraham Lincoln" (1899); "Oddities of Southern Life" (edited).

**Wattevillite** (after M. V. Watteville, of Paris), a mineral occurring in very minute acicular crystals, forming finely fibrous aggregates; crystallization, uncertain; sp. gr., 1.81; color, white; luster, silky; composition: Essentially a hydrated sulphate of lime, soda, potash, magnesia, yielding the typical formula, $RSO_4 + 2H_2O$.

**Wattle Bark,** the bark of various Australian acacias, specifically *Acacia decurrens, A. melanoxylon, A. dealbata, A. floribunda,* and *A. affinis.* It is largely exported to Europe to be used in dyeing, and the trees are so largely destroyed to furnish it that vast tracts of acacia forest in Australia are now left bare. *A. decurrens* is cultivated for its bark in the Neilgherry Hills and some other parts of India; but the ordinary Indian wattle bark is furnished by *A. arabica.*

**Wattle Bird,** an Australian bird (*Anthochæra carunculata*) belonging to the honey eaters, and so named from the large reddish wattles on its neck. It is about the size of a magpie, and is of bold, active habits.

**Wattle Tree,** a name given in Australia to several species of acacia.

**Wattle Turkey,** a name often given to the brush turkey.

**Watts, Alaric Alexander,** an English educator, poet, and journalist; born in London, England, March 16, 1799. His journalistic work was done with the Manchester "Courier," the London "Standard," and the "United Service Gazette." He edited a series of annual volumes, "Literary Souvenir" (1825–1835), and published "Poetical Sketches" (1822), and "Lyrics of the

Heart" (1851). He died in Kensington, England, April 5, 1864.

**Watts, George Frederick,** an English painter; born in London, England, in 1817. He first exhibited at the Royal Academy in 1837. In 1842 and 1845 he secured prizes of $1,500 and $2,500 from the Commissioners for the Decoration of the Houses of Parliament for his "Caractacus," and "Alfred Inciting the Saxons to Maritime Enterprise"; afterward painting "St. George and the Dragon" in Westminster Palace, and the "School of Legislation" for Lincoln's Inn. Among his more important pictures are: "Life's Illusion" (1849); "The Window Seat and Sir Galahad" (1862); "Ariadne" (1863); "Esau" (1865); "Love and Death" (1877); "Time, Death and Judgment" (1878); "Happy Warrior" (1884); "Hope" (1886); "Judgment of Paris" (1887); "The Angel of Death" (1888); and "Fata Morgana" (1889). He was one of the most subtle and powerful of portrait-painters, among his successful work being Tennyson, Millais, Browning, etc. He became R. A. in 1868, and in 1886 presented some of his most celebrated pictures to the nation. He died July 1, 1904.

**Watts, Henry,** an English writer on chemistry; born in London, England, Jan. 20, 1815; in 1837 became demonstrator of Chemistry at University College; librarian to the Chemical Society in 1850; and editor of its "Journal" in 1861. He translated Gmelin's "Manual of Chemistry" (18 vols.) and other chemical works, but is best known by his "Dictionary of Chemistry," based on that of Dr. Ure (5 vols. 1863–1868; new and revised ed. by Morley and Muir, 4 vols. 1889 *et seq.*). He died June 30, 1884.

**Watts, Isaac,** an English hymnologist; born in Southampton, England, July 17, 1674. He studied at a Nonconformist academy at Newington, London; was appointed (1698) assistant clergyman to the congregation worshiping in Mark Lane; some years after (1702) sole pastor of the same body. Forced by bodily weakness to resign his charge (1712), he spent the rest of his life at the family seat of Sir Thomas Abney, Abney Park, near London. He wrote

ISAAC WATTS.

"Hymns and Spiritual Songs" (1707); "Divine and Moral Songs for the Use of Children" (1720); "A Manual of Logic" (1725); several volumes of "Sermons," besides other works of less note. As a religious poet Watts has been always widely popular. His hymns are marked by religious fervor and evangelical zeal. Widely separated parties have used them as manuals of Christian devotion, and they have come home to the heart of the English common people in a way that no other devotional lyrics, not even Wesley's or Cowper's, have done. The "Logic" of Watts was for long a widely popular book. Though not distinguished by profound metaphysical thought, it is yet a very able treatise. It is plain and practical, vigorous and sensible, and may even yet be read with profit. The works of Watts were published in a collected form first in six then in nine volumes (Lond. 1810–1812). He died in Theobaldo, Herts, England, Nov. 25, 1748.

**Watts-Dunton, Theodore,** an English poet and critic; born in St. Ives, Huntingdonshire, England, in 1836. He was educated at Cambridge; afterward settling in London, he soon became the center of a remarkable literary and artistic company, including Philip Bourke Marston, Rossetti, Browning, Tennyson, Swinburne, etc. He wrote extensively in periodicals, and the books: "Greeting at Spithead to the Men of Greater Britain" (1897); "The Coming of Love" (1897); "Aylwin" (1898). The poems of his which are most generally known are "The Burden of the Armada" and "The Ode to Mother Carey's Chicken," the latter of which has been often reprinted in England and America.

**Watt's Dyke.** See OFFA'S DYKE.

**Wat Tyler's Insurrection.** See TYLER'S INSURRECTION.

**Waugh, Edwin,** an English dialect-writer; born in Rochdale, Lancashire, England, Jan. 29, 1817. He wrote "Sketches of Lancashire Life and Localities" (1855; 4th ed. 1869); "Poems and Lancashire Songs" (1859); "Rambles in the Lake Country and its Borders" (1863); "Tufts of Heather from the Lancashire Moors" (1864); "Irish Sketches"; "Home Life of the Lancashire Factory-Folk" (1866); "Sancho's Wallet"; "The Chimney Corner" (1879); etc. "Posies from a Country Garden" (2 vols. 1865) is a selection from his poems. He died in New Brighton, England, April 30, 1890.

**Waukegan,** a city and county-seat of Lake co., Ill.; on Lake Michigan, and on the Elgin, Joliet, and Eastern, and the Chicago and Northwestern railroads; 35 miles N. W. of Chicago. The principal part of the city is built on a bluff which rises rather abruptly to the height of 50 feet. Here are

many churches, a high school, School of the Immaculate Conception, St. Alberta's Convent, St. Joseph's School, public library, waterworks, electric lights, street railroads, National and State banks, and several weekly newspapers. Waukegan is largely interested in the lake fisheries. It has flour mills, tanneries, the Forsyth Scale Works, a pump factory, silver plating establishment, and manufactories of farming implements, sashes, doors, blinds, etc. It also has a good trade in grain, wool, and butter. Pop. (1900) 9,426; (1910) 16,069.

**Waukesha,** a city and county-seat of Waukesha co., Wis.; on the Fox river, and on the Wisconsin Central, the Chicago and Northwestern, and the Chicago, Milwaukee, and St. Paul railroads; 20 miles W. of Milwaukee. It contains Carroll College (Pres.), a high school, Keeley institute, the State Industrial School for Boys, electric lights, National bank, and several weekly newspapers. The city is chiefly noted for its wonderful springs of medicinal waters. It has bottling works, quarries of excellent building stone, extensive malleable iron works, and the shops of the Wisconsin Central railroad, and an assessed property valuation exceeding $3,250,000. Pop. (1890) 6,321; (1900) 7,419; (1910) 8,740.

**Waul, Thomas Neville,** an American lawyer; born in Sumter District, S. C., Jan. 5, 1813; was educated at Columbia College in 1829–1832, and was later admitted to the bar and began practice in Mississippi; removed to Gonzales co., Tex., in 1850; was a member of the Provisional Congress of the Confederate States in 1861. During that year he recruited 2,000 troops, known as Waul's Legion; was commissioned colonel of this body; and remained with it throughout the war. He rendered the Confederates important services as commander of the defenses at Tallahatchie and Yazoo rivers, Miss., and during the seige of Vicksburg; was promoted Brigadier-General and later took a conspicuous part in the battles of Pleasant Hill and Mansfield, La. He was subsequently seriously wounded while leading a division in the battle of Saline. In 1865 he was a member of the Texas Reconstruction Convention; resumed the practice of law in Galveston, Tex.; and retired in 1896. He died in 1903.

**Wausau,** a city and county-seat of Marathon co., Wis.; on the Wisconsin river, and on the Chicago and Northwestern, and the Chicago, Milwaukee, and St. Paul railroads; 200 miles northwest of Milwaukee, Wisconsin. Here are located numerous churches, court house, County Insane Asylum, waterworks, electric lights, National banks, and daily and weekly newspapers. Large quantities of lumber are here shipped down the river in rafts. The chief industries are those connected with the lumber trade. Besides the lumber industry the city has granite quarries, mills, etc., and an assessed property valuation exceeding $3,500,000. Pop. (1890) 9,253; (1900) 12,354; (1910) 16,560.

**Wave,** one of a series of undulating inequalities on a surface; an undulation; a swelling outline. The undulating streak or line of luster on cloth, watered and calendered. Anything which advances and recedes, rises and falls, comes and goes, or increases and diminishes with some degree of regular recurrence, like a wave; as, a wave of prejudice, a wave of popularity, etc. A waving or undulating motion; a signal made by waving the hand, a flag, or the like.

In physics, an undulation; a movement which, though it seems progressive, is in reality only up and down, or, to a certain extent, to and fro, though it is transmitted to a distance by the fact that at each successive point the otherwise similar motion of a single particle takes place a little later in time = the time which it takes for the motion to be communicated from the preceding moving particle. Waves exist in water, in air (sound waves), in ether (light waves), etc. A wave on the ocean alternately rises into a ridge and sinks into a depression (the trough of the sea). Anything floating, say a quantity of sargasso seaweed, rises on a billow and sinks again as the wave falls, without otherwise changing its place. Even the undulatory movement effects the water only to a few feet in depth, where, unless there are submarine currents, all is still. When a wave comes inshore and enters a narrow gulf, it becomes affected both by the return of the reflex waves from its sides and the friction of the bottom, if the water be shallow, so that instead of a movement mainly up and down, it now becomes progressive, and breaks in a series of billows on the sands or rocks. In the former case the water runs up the sand, and then recedes considerably before the next wave comes in. Sea waves are mainly caused by the wind. If a breeze blowing off the shore cause ripples near the land, these will rise higher the farther they are from the shore if the cause which brought them into being continues to operate. Out on the open ocean they rise to some feet in elevation, but it is a great exaggeration to call them "mountains high"; they have, however, been witnessed approximately 60 feet from trough to summit in the Atlantic. When they rise into a sharp ridge, and the wind is strong, they crest over, break, and fall on the leeward side with abundant spray; but this does not occur on the ocean to the same extent as near shore. The force of waves is so great that, geologically viewed, they are a potent force in altering the conformation of coasts. When in a storm they break with transcendent force

on a shore they scoop out soft shales into caves, allowing the harder rocks above in time to fall in, or they break off portions of those harder rocks themselves, besides grinding against each other any fallen slabs which may already be lying on the beach.

**Wave Length,** the distance, in all kinds of wave motion, from crest to crest of successive waves. In the wave motion of light these distances are almost inconceivably minute. The wave in the visible part of the spectrum ranges from about $\frac{1}{33000}$ inches in the red end to about $\frac{1}{63000}$ inches in the violet. In the yellow part of the spectrum, where it is brightest (in sunlight) the wave is about $\frac{1}{43000}$ inches. When we remember that light travels through space with a velocity of about 186,000 miles per second, if we wish to get some faint idea of the almost inconceivable frequency of the vibrations, multiply the denominators of the above fractions by the number of inches in 186,000 miles. We shall find that the extreme red light vibrates about 400,000,000,000,000 times, the yellow light about 510,000,000,000,000 times, and the extreme violet light about 800,000,000,000,000 times per second. The difference of color is simply a difference of wave length and frequency, for, so far as known, they all travel with the same velocity. There are heat rays, or vibrations, which are invisible to the eye, of much greater wave length and less frequency. These are below the visible red in the spectrum. There is no difference between the radiations that we call by the different names of heat, light, and chemical (or actinic) rays except in the wave lengths and frequency of their vibrations.

**Wave-line Principle,** in shipbuilding, the principle of building ships with contours scientifically adapted to the curves of the sea waves they have to traverse. It was introduced by Scott Russell in consequence of experiments made by him in 1834. The principle is now generally adopted.

**Wavellite** (after Dr. Wavell, who discovered it), an orthorhombic mineral, mostly occurring in globular or hemispherical groups of radiating crystals; hardness, 3.25–4; sp. gr., 2.337; luster, vitreous, sometimes resinous; color, white, shades of yellow, green, gray, brown, black; composition: Phosphoric acid, 34.4; aluminum, 37.3; water, 28.3 = 100, which is equivalent to the formula, $3Al_2O_32PO_5 + 12HO$.

**Wave Offering,** Hebrew, *tenuphah* = agitation, tumult, a wave offering, from *nuph* = to agitate, to wave. An offering which is believed by the rabbis to have been waved to the four points of the compass, "before the Lord," as an acknowledgement of His sovereignty over the earth. It is often combined with the similar heave offering, believed to have been waved upward as an acknowledgment of His rule over heaven. It is connected also with the peace offering, of which it, as a rule, constituted a part. When an animal was presented in sacrifice, the shoulder was often offered as a heave offering and the breast as wave offering. Both afterward became the perquisites of the priests. On the second day of the Passover a sheaf was waved. At Pentecost two lambs of the first year were to be offered as a peace offering, and both were to be waved (Lev. x: 14, xxiii: 11–15, 20; Numb. vi: 20, xviii: 11).

**Wavre** (vävr), a town in the Belgian province of Brabant, 15 miles S. E. of Brussels; pop. 7,432. Here on June 18, 1815, there was a fiercely contested battle between the Prussians under Thielmann and the French under Grouchy, in which the Prussians successfully prevented the French from joining Napoleon at Waterloo. See WATERLOO, BATTLE OF.

**Wax,** a name given to various animal and vegetable substances having analogous physical peculiarities, but differing somewhat in chemical constitution and in other properties. They are all hydrocarbon compounds allied to oils and fats, but common wax differs from the ordinary fats in containing no glycerin. In addition to beeswax, which is the variety commonly indicated when the term is used, the following substances are known under the name of wax: Chinese wax, or pela, a body obtained by the puncture of the branches of certain trees by an insect, *Coccus pela*, allied to the insect which similarly produces cochineal. Pela is a hard, glistening, white, semi-crystalline solid, resembling spermaceti, and fuses at 179.6° F. It is composed principally of cerotin, the principal constituent of bees' wax. Japanese wax is a hard, whitish, fatty substance, said to be obtained from the *Rhus succedanea*. It melts at 107.6° F. Carnahuba wax is a product from the leaves of the palm, *Corypha cerifera*, growing in Brazil. It is of a greenish-white color, excessively hard, and fuses only at 182.3° F. Palm wax is a closely-allied product obtained from the palm, *Ceroxylon andicola*, of South America. Its fusing point is about the same as that of Carnahuba wax. Myrtle wax is obtained from the berries of *Myrica cerifera*, and other species growing principally in the United States, but also in Cape Colony. It forms a greenish-colored, hard, solid, substance.

Common wax, which forms the honeycomb of the various species of bees, is in its unbleached condition a hard unctuous solid, possessing usually a faint sweetish odor, but no taste. It is easily separated from the extraneous matter of the comb by melting in water, when the wax floats on the surface of the water as a thin, oily fluid, which is drawn off and allowed to solidify

into cakes. A large amount of unbleached wax from almost all regions is annually imported into the principal countries. The preparation of purified or white wax (*Cera alba*) is accomplished by exposing the substance in very thin flakes or shreds to the influence of the atmosphere and light, the wax being periodically watered and turned, as is done in the case of grass bleaching of linen, etc. When the whole of the surface color has disappeared the wax is remelted, and a new surface is thereby obtained for exposure, and the treatment is thus continued till a uniform white color is obtained throughout the mass. Wax may also be bleached by the use of bleaching powder and other chemical agents, but the process is objectionable, because it not only injures the material, but in the case of bleaching powder the whole of the chlorine is not removed; and when the wax so treated is used for burning, irritating and deleterious fumes of hydrochloric acid are given off. Pure white wax consists to the extent of nearly 80 per cent. of cerotin, soluble in boiling alcohol, with nearly 20 per cent. of an insoluble waxy substance called myricin, and a small proportion of cerolein, which gives hardness to the mass. It is semi-transparent,, tasteless, and inodorous, softening so as to admit of being molded by the fingers at 85° F., and melting at 145° F. It is chiefly used for making candles of unequalled beauty and illuminating effect, for modelling and making wax flowers and fruits. Medicinally, white wax has emollient properties, and is chiefly employed as an ingredient in ointments and in the preparation of simple ointment. Yellow wax is also used as an ingredient of plasters and ointments. Owing to its high price, white wax is much adulterated with spermaceti and inferior waxes, and even with starch, etc.

**Wax, Mineral,** a popular name for certain fossil hydrocarbons, which occur in small quantities chiefly in the Carboniferous formation. The most familiarly known variety, viz., ozokerit, has been used for the manufacture of candles, which are of a shining black color, unless purified by a complicated process. Preparations of a similar nature are now employed, especially in the United States as a basis for medicinal ointments, and are sold under the name of ozokerine, etc. They possess a great advantage for this purpose over lard, from their non-liability to turn rancid.

**Wax, Modeling in.** The wax works of today have reached probably the highest degree of excellence. The well executed figure has all the grace that a living figure could show if posed in as immovable a style as the other. They all look stiff to the eye which lingers on them for any length of time, because they are absolutely motionless. A single glance at a good figure will find in it not only a good pose, but what the artist calls action, but when the eye gets more accustomed to the work its immovability soon suggests a stiffness that is really not evident.

Some years ago several expert wax figure makers, Frenchmen for the most part, were brought to the United States. The leading man in an establishment of this kind is the sculptor. To secure good results it is necessary that the sculptor should be highly capable. When a single figure or a group is needed the sculptor gets together his pictorial matter, if the order is for something historical, and with the aid of this material he makes a careful drawing, showing the figures properly draped, and, in addition, all the accessories that would go into the completed work. This sketch being approved, a small model in bas-relief is made of the whole design, and this miniature design being approved, or altered till satisfactory, the actual work is begun.

As the average wax figure is the reproduction of some man or woman of note in past or present the greatest skill on the part of the sculptor is necessary to produce a likeness. Very often there is nothing but a portrait to work from, and that is not always in the exact shape or position that the group calls for. There have been many instances, however, where living celebrities have consented to pose for the sculptor, and thus made a strong work possible. When the sculptor has secured all the material possible he begins to shape a head in clay. If the design calls for an exposure of the body below the neck, as in the case of a savage, or, perhaps, a woman in a décolleté dress, the shoulders are reproduced in clay as well as the head. If the face is a bearded one the beard is modelled in form, and naturally to secure a likeness the hair of the head is also formed. When the head is finished in clay it is approved either as regards its proportions or its likeness to the original, and when so approved it is ready for the molder to handle.

The next operation is an important one, as it means, to a certain extent, the possible destruction of the likeness obtained by long and patient work. This operation is the cutting away of all the clay which represents the hair and beard of the original. This mutilation is necessary, because the hair and beard are to be made eventually of the real article. The head of clay, when stripped, is now oiled and then covered with a coating of plaster of Paris about three or four inches thick. In 10 minutes this coating is partially hardened and the work of cutting the mold into pieces is begun. A sharp knife will cut through this dough-like substance, now too soft to chip and too hard to run. When the mold is cut

Wax

in five or six pieces the lowest end, at the base of the neck, is cut away in the center, leaving an opening about five inches in diameter, if the head is life size. On one of the cut sides of each piece the artist makes two or three holes at intervals of three inches. On the piece which fits against it he places little dabs of soft plaster. The holes are now oiled and the whole mold is put together again. The soft plaster dabs are now allowed to harden in the oiled holes, and when the mold is taken again it is provided with little "locks," which prevent the pieces from slipping apart at an inopportune moment. While these operations on the head are under way the bodies which are to complete the figures are being made in a somewhat different manner. As explained above, only those portions of the upper part of the body as are to be exposed are made in clay. The hands, arms and extremities are made in most cases from living models.

When a group has been designed the different positions of the hands and arms are made from male and female models, and a plaster cast is made from them in the same way as described above. In a great many cases where certain poses are needed casts are also made from the lower limbs of both sexes. Even the trunk is sometimes reproduced in this way. As none but the exposed portions of a figure are made of wax, on account of the great cost partly, the bodies are made of papier-maché. The mold for these portions of the figure are made in two pieces for each lower limb, upper limb, forearm, upper arm, or trunk. These molds, when perfectly hard, are ready for the mannikin maker. A woman does this work. The first operation is the fitting of pieces of cardboard in each half mold. To this is glued a layer of coarse bagging and after that alternate layers of cardboard and bagging till the structure is nearly a quarter of an inch thick. It is then coated on the inside with a thin layer of plaster. When all these parts are taken from the molds and put together the result is a very graceful reproduction of a nude human figure, minus the arms, head and neck in most cases, though the arm is very often made in this way.

For finishing in wax these particular molds are taken to the wax room, a sort of hot box, the temperature being at 120° at all times. The most delicate operation of all is now made. In a long, wooden tank at one end of the room the mold is placed in water. Connected with this bath is a steam-pipe. When the mold is ready the steam is turned on, and, the water becoming heated, the mold is soon ready for the wax. The wax used for the figures is the best obtainable quality of American bleached beeswax, which comes in thin disks. It is perfectly white when bought, and in this state it is melted down till it has reached the consistency of oil. As it is not desirable to make the heads and hands of such pale material, the artists colors it to suit his needs. For a head and face he mixes in the wax when melted certain quantities of dry colors. These colors are Prussian blue, crimson lake and silver white. When the wax is meant for heads requiring a more somber tint or for the hands of males, some burnt umber is added. It is necessary to insure a good wax mold to have an almost exact temperature in the wax and the heated plaster mold. Experience has taught the artist the proper time to take out his plaster, and when it is just hot enough it is oiled to prevent the wax from sticking and stood on its head on the stone floor.

A large funnel is now placed in the opening at the neck and the wax is poured into the funnel, the lower end of which is as far down in the mold as it will go. When the amount of wax needed to fill the whole space has been poured in, the funnel is pulled out slowly and the wax is distributed gradually. If the wax is poured directly into the mold from the large tin vessel in which it is melted bubbles are apt to form in places where they may mar the surface of the head. After 15 minutes' time has partially hardened the wax nearest the mold, the soft wax in the center is poured back into the tin. In the 15 minutes allowed for cooling, the wax left in the mold when the soft portion is poured out is about one-quarter of an inch in thickness, though it may vary a sixteenth in some places. Such variation is not objected to, as it serves to give transparency to the head.

The day following the melting the head is ready for its final shaping. Though it is now perfect as regards the general features, there are many roughnesses apparent, especially along the lines where the plaster mold had its joinings. These lines and any little lumps that may have been caused by small holes in the plaster are carefully shaved down. The eyes of the waxen head are simply rounded reproductions of the human eyeball and the mouth is generally partially open, with no modellings of the teeth. When the wax is as hard as it can be made by the atmosphere a crooked tool with a round end it heated and the eyes are burned out from the inside of the hollow head. The back wall of the open mouth is similarly treated, and the head is now ready for the accessories. The rims of the eye have to be painted and other parts of the face made deeper or lighter in color. One of the most artistic operations is the reproduction of the color of the human lips. This effect is not made with paints, but is obtained by the skillful laying on of colored wax. A spatula, a small modelling tool, is heated in an alcohol flame and pressed into a cake of

wax of the proper color. This while hot is distributed along the two lips thinly, and though it gets lighter in color when hot it dries or hardens to just the desired tint. In heads where the design calls for uneven teeth the artist introduces small pieces of wax and shapes them to suit the subject. Ordinarily the teeth used are the usual variety of false teeth procured from the dentist supply houses.

Many of the male heads have to be represented as recently shaven, and the work necessary to give the life-size face this effect is something enormous. With a little sharp needle point the artist punctures the face in many thousand places. While the holes are not as close together as the hairs in a man's beard are the head when finished has the proper appearance. After the tedious operation of puncturing is done black color is rubbed all over the cheeks and the chin, and then the surface of the face is wiped off with a dry cloth. The paint that has gone into the little holes in the face remains, and the effect is very natural. Putting in the eyelashes is a very difficult and slow piece of work. The wax at the eyelid is very thin, as the edge has been trimmed to sharpen the lid and do away with any appearance of clumsiness. Along both lids little holes very close to one another are punched, and every hair has to be carefully pushed in and poised so as to give the whole row a natural regularity. The eyes used in the figures are about the only things that have to be imported. They are made to order and come in several sizes. An evidence of the care that artistic feeling prompts the clever modeler to take is the making of the finger-nails of his figures. Thin sheets or strips of horn, very transparent and nail-like are cut out to fit the large or small fingers. A small piece of the pink wax used to color the lips is put on each one before it is affixed to the finger end. When the nail is in place the hand looks as though it could move, so lifelike has it become.

**Waxbill,** a small finch, genus *Estrilda,* so called from its beak being red like wax. It is often kept in cages.

**Wax Insect,** the *Coccus sinensis,* or *Pela,* a small white insect, a native of China, valuable on account of the wax it produces. It feeds chiefly on a kind of sumach (*Rhus succadaneum*), and the wax is deposited on the branches as a coating which resembles hoar frost. This is scraped off and used for making candles.

**Wax Palm,** Humboldt's name for *Ceroxylon andicola,* a fine palm, growing in the Andes of New Grenada, near the sources of of the Magdalena and Cauca rivers. It has a straight stem, somewhat thicker at its middle part than above or below, and terminating above in a tuft of six or eight large pinnate leaves. The flowers, which are polygamous, are in panicles, the caylx of three small scales, the petals three, the stamens numerous, with short filaments; the fruit, a small round drupe with a single seed. The trunk is covered with a coating of wax, which exudes from the space between the insertion of the leaves. According to Vauquelin, this wax is a concrete inflammable, substance, consisting of one-third of actual wax and two-thirds of resin.

**Wax Tree,** the *Vismia,* a genus of *Hypericaceæ,* in which some of the tropical American species yield a copious supply of the yellow resinous juice characteristic of the order. This gum resin so much resembles gamboge in appearance that it is called American gamboge: it possesses like purgative properties.

**Waxwing** (*Ampelis garrula*), an insessorial bird belonging to the dentirostral section of the order. It derives its names from

BOHEMIAN WAXWING.

the appendages attached to the secondary and tertiary quill feathers of the wings, which have the appearance of red sealing-wax. The Bohemian waxwing sometimes visits England. An American waxwing is the cedar bird.

**Waxy Degeneration,** a morbid process in which the healthy tissue of various organs is transformed into a peculiar substance, allied in its chemical composition to albuminous substances. Organs affected by this degeneration have a certain resemblance in consistency and physical character to wax. They may be cut into portions of the most regular shape, with sharp angles and smooth surfaces; and the thinnest possible slices may be removed by a sharp knife for microscopical examinations. Such organs are abnormally translucent, increased in volume, solidity, and weight. Usually the first parts affected by this degeneration are the small blood-vessels, the middle or muscular coat being first changed. Subsequently the adjoining tissues become similarly affected. When a solution of iodine is brought into contact with such tissues, a

deep reddish-brown color is produced; and this color is alone a sufficiently characteristic test. Though amyloid degeneration is common to many tissues and organs, the parts most frequently affected are the spleen, liver, kidneys, lymphatic glands, and intestines. Waxy degeneration is very rarely met with as a primary condition. It is almost always the sequel to some chronic wasting disease, and is particularly associated with profuse and long-continued suppuration, as in strumous disease of bone, diseases of the lungs, kidneys, or intestines, with much purulent discharge; and with advanced constitutional syphilis. It can thus rarely be regarded as itself the cause of death, though it may materially hasten the fatal issue. No treatment is known to be of any avail; but when the degeneration is not very far advanced, it may gradually disappear if the suppuration or other morbid condition which has led to its development is arrested.

**Way,** that along which anything is carried or conveyed; a highway, road, lane, or path of any kind; a street; any place for the passing of men, cattle, or other animals. A moving; passage; transit; travel; journey, progression. Length of space; distance; as, he has traveled a long way. Direction of motion or progression; course of travel; tendency of action or advance; as, I did not notice which way she took. Manner or method of doing anything; means of accomplishment; scheme of management or execution; device; as, there are two ways of doing a thing — the right way and the wrong way. Manner of thinking or behavior; style; mode; method; fashion; as, he has a quaint way of expressing himself. Manner of practice; method or plan of life and conduct; process of things, good or bad; mode of dealing; regular plan or course of action; as, some men are odd and singular in their ways. General scheme of action or conduct; determined course or tendency; as, he is resolved to have his own way.

In law, either the right which one or more persons have passing over the land of another, or the space over which such right is exercisable. Ways are of various kinds; as a footway, for persons passing on foot only; a horseway, for persons passing on horseback; a driftway, for driving cattle; a carriage way, for driving carriages and other vehicles. All these may be either public or private ways, the former open to all, the latter only to particular persons or classes of persons. A private right of way may be grounded on a special permission, as where the owner of the land grants to another the liberty of passing over his land; in which case it is confined to the grantee alone, and cannot be assigned or conveyed to another. It may also be to the grantee, his heirs and assigns, being owners of such a house or close; in which case the right passes with the ownership of such property. The granter may also impose such restrictions upon his grant as he thinks proper. A private right of way may be also constituted by prescription, as where all the owners and occupiers of such a farm, or all the inhabitants of such a hamlet, have from time immemorial used to cross such ground, such usages supposing an original grant. Twenty years' occupation of land, adverse to a right of way and inconsistent therewith, bars the right.

Way of the rounds, in fortification, a space left for the passage round between a rampart and the wall of a fortified place. Way and ways are sometimes used in phraseology in the sense of the terminal syllable "wise"; as, he married a woman in no ways his equal.

**Way Board,** in mining, a term now somewhat extensively adopted by geologists to designate the bands or layers seperating thicker strata, and marking the line at which the latter tend to separate. Thus thick beds of limestone, or of sandstone, may be separated by thin layers of shale.

**Wayfaring Tree,** *Viburnum lantana,* a large and much branched shrub, 6 to 20 feet high, the young shoots very downy. Leaves elliptic, cordate at the base, serrate, veined, downy beneath, the pubescence being stellate; flowers white, in large dense cymes; berry purplish-black. It flowers in May and June.

**Wayland, the Smith,** a hero of German saga; was originally a kind of demi-god in popular mythology, with points of identity with the Greek Hephæstus and Dædalus. He was son of the sea giant Wade, a nephew of King Wilkinus, and was first bound apprentice to the famous smith Mimir. Then he was carried across the sea to the dwarfs, whom he soon surpassed in their own science. He dwelt a long time in Ulfdaler along with his two brothers, Eigil, the best archer, and Slagfidr, and here they met three swan maidens, with whom they lived for seven years, till these flew away to follow battles as Walkyries. Afterward Wayland came to King Nidung, who cut the sinews of his feet and put him in prison, for which he revenged himself by putting the king's two sons to death, and violating his daughter Baduhild, who afterward gave birth to Wittich. Wayland then flew away in a feather robe, which he himself manufactured, and which his brother Eigil had tried first, only to be precipitated to the ground. The legend is often alluded to in Scandinavian, Anglo-Saxon, English, and German poems, and even old French poems tell of Galant the smith. Wayland Smith's cave, a two-chambered megalithic monument, near the White Horse in Berkshire, England, is immortalized in "Kenilworth."

**Wayland, Francis,** an American educator; born in New York city, March 11, 1796; was graduated at Union College in 1813, and was president of Brown University in 1827–1855. He was the author of many valuable works, including: "Elements of Moral Science" (1835); "Elements of Political Economy" (1837); "Limitations of Human Responsibility" (1838); "Domestic Slavery Considered as a Scriptural Institution"; "Elements of Intellectual Philosophy" (1854); etc. He died in Providence, R. I., Sept. 30, 1865.

**Wayne, Anthony,** an American military officer; born in East Town, Chester co., Pa., Jan. 1, 1745; became a land surveyor; was an intimate friend of Franklin, and early took an active interest in public affairs. Having married and settled to farming (1767), he was elected to the Pennsylvania convention and Legislature in 1774, served on the committee of safety, and in 1775 raised a regiment with which he took part in the campaign against Canada. He fought with distinction and was wounded at the battle of Trois Rivières (Jan. 3, 1776); held the fortress of Ticonderoga and Mount Independence till May, 1777; and, after receiving the commission of Brigadier-General, led a division at Brandywine (Sept. 11), and commanded the right wing at Germantown (Oct. 4). He made a dashing raid on the British lines in the winter of 1777–1778, carrying off a great quantity of supplies, and on the night of July 15, 1779 achieved the most brilliant of the American victories in the storming of Stony Point, for which he received a gold medal and the thanks of Congress. By a bayonet charge he rescued Lafayette in Virginia in 1782; made a daring attack on the whole British Army at Green Spring (July 6), and defeated the British and Indians in Georgia. After the war "Mad Anthony" retired quietly to his farm, but he was made Major-General in 1792, and again took the field, this time against the Western Indians, whom he overthrew at Maumee Rapids, and forced to conclude the treaty of Greenville (1795). On his way back to his farm at Waynesboro he died at Presque Isle (now Erie), Dec. 15, 1796. A monument was erected to him at Waynesboro in 1809.

**Wayne, Fort.** See Fort Wayne.

**Waynesburg College,** a coeducational institution in Waynesburg, Pa.; founded in 1851 under the auspices of the Cumberland Presbyterian Church; has an endowment of about $80,000; grounds and buildings valued at over $275,000; volumes in the library, about 5,000; average number of faculty, 15; average student attendance, 200; graduates, over 700.

**Wayzgoose,** an annual dinner of the persons employed in an English printing office; a printer's bean feast. Timperley says: "The derivation of this term is not generally known. It is from the old English word *wayz* = stubble. A stubble goose is a known dainty in our days. A wayz goose was the head dish at the annual feast of the forefathers of our fraternity."

**Wazaramo.** See Zaramo.

**Waziris** (the children of Wazir or Vizier), a tribe of independent Afghans, who occupy the Suleiman Mountains, on the W. frontier of the Punjab, British India. It is estimated that they can furnish 44,000 fighting men. Some of them have settled quietly within British territory, chiefly in the district of Bunnu, where they cultivate 27,000 acres and pay a revenue of $4,500. The majority yet live in the hills, a terror to all their neighbors, especially to the caravans that traverse the Gomul pass. Their crops are wheat, maize, and barley; they rear horses and sheep, and export iron and wood.

**Weald Clay,** in geology, the upper stratum or series of strata of the British Wealden formation. It is about 1,000 feet thick, and, with the exception of its upper portion, which is fluvio-marine, is of freshwater origin. It constituted the delta of a great river, which slowly subsided till at length the ocean was let in. The delta was inhabited by great Saurians, of the genera *Iguanondon, Hypsilophodon, Pelorosaurus, Orniathopsis,* and *Hyœosaurus.* These, becoming submerged as the delta sank, became imbedded, not in the Weald clay, but in the overlying Kentish Rag which succeeded the clay, and rests on it conformably. Throughout the clay itself are casts of Cyprides, and there are occasional bands of Sussex marble composed almost entirely of a species of Paludina. The Weald clay constitutes a valley between the elevated ridges of the Hastings Sand and the chalk downs of Kent, Surrey, Hampshire, and Sussex, from Hythe by Tunbridge, Hartingcombe, and Hailsham to Pevensey.

**Wealden,** in geology, a formation or group of rocks consisting of clay, shale, sand, sandstones, grits, and limestones, constituting the lowest part of the Cretaceous system. In 1822 Gideon Algernon Mantell (afterward Dr. Mantell) correctly showed that it was of fluviatile origin, though intercalated between marine Oölite below, and Greensand, also marine, above. The name, Wealden Formation, was first introduced by Mantell, to whom it had been suggested by J. P. Martin, of Pulborough. The Wealden has been generally divided into the Weald Clay, constituting the upper beds, the Hastings Sand in the middle, and Purbeck beds below; but the Purbeck beds are now considered to be Oölite, or to be intermediate between the Oölite and the Wealden. The

Weaning

thickness of the true Wealden formation in Swanage Bay, where it is most highly developed, may be 2,000 feet. Its fauna consists of great reptiles, fishes of the genus *Lepidotus*, and fresh-water mollusks, *Physa*, *Limnæa*, etc.; its flora of conifers, cycads, and ferns, but no dicotyldedonous angiosperms. The delta of the old Wealden river has been traced about 200 miles from E. to W., and 100 miles from N. to S. Much has been swept away by denudation. The Quorra or Niger in Africa covers 25,000 square miles; the Wealden river therefore probably approached, and may possibly have exceeded it in magnitude. It drained a large part of a continent, the area and exact situation of which are unknown. The Wealden of Hanover and Westphalia constitutes the delta of a second river distinct from the first.

**Weaning,** the separation of an infant from the mother's milk as food. The separation of the child from the mother necessarily involves a crisis in its existence, and is attended with more or less constitutional disturbance. When the state of health of both mother and child is favorable, it has to be determined what is the proper time for weaning. As a purely physiological question it must be evident that there is a definite time at which it is proper for the well being of both mother and child that the latter should enter on an independent period of existence. It has frequently been asserted that the natural period for weaning is on the completion of the process of dentition; but as dentition is not completed till about the close of the second year, the period of suckling is much too long; for the milk secreted ceases long before that time to be sufficient for the nourishment of the child. Indeed, owing to deficiency in the quantity and quality of the milk in relation to the wants of a healthy, vigorous child, the cases are exceptional in which a woman is able to suckle her child, without assistance in the way of extra aliment, for a longer period than 10 months; and a large proportion of mothers require supplementary aid much sooner. When the mother, or nurse, is healthy and vigorous, the child should have nothing but what is obtained from the breast for the first six or seven months. A partial failure in the quantity or quality of the milk may occur at a much earlier period, so that it may be necessary even at the second or third month partially to feed while nursing is going on.

No definite time, as to months, can be fixed at which the child should be weaned; but, as a general rule, it should be from the 7th to the 12th month, and certainly not later than the latter period. In all cases it is advisable to accustom the infant to other food before weaning; otherwise the process is much more troublesome. The quantity of milk should be gradually and steadily diminished, and the proportion of other nutriment should be steadily increased till the latter alone remains. If the weaning process be thus conducted, a minimum amount of discomfort will follow, and the screaming fits will not last beyond a couple of days. Discomfort may be obviated, in the case of the mother, by saline laxatives, abstinence from fluids, and the application of belladonna, or cooling lotions, to the breasts. The period of weaning should be determined to some extent by the state of the child's health, and the process should be delayed till the subsidence of a febrile attack, or of an ordinary catarrh, and during the constitutional disturbance attending dentition. In the case of a perfectly healthy child, and an average result in the eruption of the teeth, the age of about 10 months is indicated as the proper period for weaning, as there is usually a pause in the process of dentition subsequent to the appearance of the eight incisor teeth.

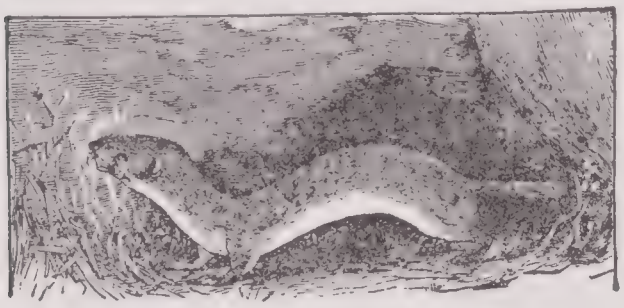
Every mother should be encouraged to nurse her own offspring, unless under exceptional circumstances, such as a deficiency in the quality and quantity of the secretion; abnormal conditions of the nipples rendering suckling difficult; excoriated and chapped nipple; inflammation and suppuration of the mammary gland. In some instances there are constitutional reasons why a mother should never nurse her children, as in cases of phthisis, epilepsy, great constitutional weakness, and nervous excitability. Among those in whom there is a hereditary tendency to insanity, an attack of acute mania may be set up by lactation. Whether the infant is brought up at the breast, or by artificially-supplied food, it should be supplied with nourishment at regular intervals, say every four hours, and not when the child begins to cry and becames restless.

When it is determined that the mother cannot suckle her child, a wet nurse should be selected, or artificial food must be given, but a wet nurse is preferable. If a wet nurse cannot be afforded or procured, the infant must be provided with such nourishment as may, chemically and otherwise, most nearly resemble that which nature provides. Asses' or goats' milk may be preferred as nearest in composition to human milk; but the milk of the cow is generally the only kind available. Cows' milk is richer than the human in the corpuscular element, and if given undiluted to a young infant it generally produces some form of gastro-intestinal disorder. If rich and pure, an equal bulk, or even more, of water may be added; but milk supplied in cities being generally previously diluted, not more than a third of added water is necessary. A little ordinary sugar, or, better still, sugar-of-milk, should be added, and the mixture

should always be given warm, or about blood heat.

If at all practicable, it is best to obtain the milk for an infant from one cow. For the first three months milk, and milk alone is the best as well as the most natural food for the child; but the safest indications for supplemental diet is in the condition of the child or of the nurse. When a child is brought up on the bottle, it is necessary that the strictest attention should be paid to cleanliness; for if the apparatus is not kept scrupulously clean, small particles of curd are apt to accumulate within it or the tube; and these, if swallowed by the infant, are apt to excite gastric or intestinal disturbance. The best kind of feeding-bottle is that with a valve in connection with the tube, as the tube is thereby always kept full, and less power of suction is required by a weak, delicate child. Many substances have been recommended as substitutes for or supplementary to milk in the alimentation of infants. Nothing is better than rusks of good quality; and, if well made, they require no boiling, but are to be covered for a minute or two with boiling water, which is then poured off, and milk or cream, with a very little sugar, added before it is broken up. When the child grows older, a little chicken soup or beef tea may be given twice a week; and an approach should be gradually made to the ordinary diet of childhood.

**Weasel,** in zoölogy, the genus *Putorius;* specifically, *P. vulgaris,* the common weasel; length about 12 inches, of which the tail



COMMON WEASEL.

occupies nearly a quarter; body extremely slender and arched, head small and flattened, eyes black and remarkably quick and lively, ears short and rounded; the neck is long, being but little shorter than the trunk and very flexible; tail short, and without a terminal tuft of hair; legs short, and furred to end of toes. Upper part light reddish-brown, under surface quite white. It feeds on mice and rats, moles and small birds, and, according to Bell, it would appear that this animal ought rather to be fostered as a destroyer of vermin than extirpated as a noxious depredator. Occasionnally the weasel becomes white in winter, though the tail always retains its reddish tinge, as that of the ermine does its black tip. In this white stage the weasel is the *Mustela nivalis* of Linnæus. In ornithology, a bird which Browne calls *Mustela variegata.* Probably the smew; *Mergus albellus,* the *M. mustelaris* of Gesner.

**Weather Box,** a kind of hygrometer, usually in the shape of a toy house, in which certain mechanical results from the weight or fixture of materials due to dampness are made to move a figure or pair of figures — a man and a woman on a poised arm, for instance, so that the former advances from his porch in wet, and the latter in dry weather.

**Weather Bureau,** the government office maintained by all civilized nations for the systematic observing and predicting of the weather from day to day. Many of these were established before weather predictions were considered practicable or even possible, and in such offices the original object of the institution was the collection of climatic statistics considered as an important item in the description of the country and the study of its agriculture, diseases, and other vital phenomena. Of such older statistical bureaus may be instanced the Meteorological Divisions of the Suregon-General's Office, U. S. A., of the Statistical Bureau in Berlin, of the Central Physical Observatory at St. Petersburg, and of the office of the Registrar-General, London. Some of these climatic bureaus have had their scope enlarged by the imposition of the additional duty of weather and storm predictions, but in most cases an entirely new office has been established for this special work; such, for instance, are the Meteorological Office in London, founded in 1861 under the Board of Trade, and now under the administration of the Royal Society; the Meteorological Division of the Astronomical Observatory at Paris, enlarged in 1859, and now transferred to the Meteorological Bureau of France; the Seewarte at Hamburg, founded in 1867, now in part transferred to the Royal Meteorological Institute for Saxony at Berlin; the Central Office for Meteorology at Rome; the Meteorological Office of the Customs Bureau at Hong Kong; the office of the Meteorological Reporter for India at Calcutta; the Imperial Signal Office at Tokio, Japan; and the Weather Bureau, formerly of the Signal Office in the Department of War at Washington, but now a part of the Department of Agricuture. The appointment of official predicters in all countries whose territories are sufficiently well covered by telegraph stations is at once a demonstration of the revolution that has taken place in our ideas with regard to the utility of meteorology, concerning which science it is only a comparatively few years since prominent astronomers and physicists expressed grave doubts as to the value of the great accumu-

lation of observations, and as to the possibility of developing any thing more than a crude and useless guess as to the weather of the forthcoming day.

To Leverrier, Fitzroy, Buys-Ballot, and Secchi are usually attributed the credit of first, in Europe, about 1855 to 1860, establishing organized weather predictions and storm signals for the benefit primarily of the navigator, but incidentally of the public at large. The undertakings of these prominent savants, however, implying as they did, a free use of the telegraph line, had been preceded by several notable experiences on a large scale; thus in England, on the occasion of the World's Fair, in 1851, bulletins and charts were displayed daily at the Exposition building, showing the weather prevailing at numerous points in the telegraph system. This was an enterprise of the telegraph company, and served at that early date to call attention in England to the possibility of attaining a comprehensive view of the state of the atmosphere at any moment. Even earlier than this the rapid growth of the electro-magnetic telegraph in the United States had allowed the meteorologists of this country to imitate a similar work. So much credit is due to the Americans Espy, Redfield, Loomis, and Joseph Henry for their unceasing efforts from 1839, when Espy and Bache began their activity in Philadelphia, till 1850, when the Smithsonian Institution had a well-organized system of daily telegraphic reports, charts, and occasional predictions, that it must be acknowledged that American students and telegraphers have taken the lead historically in the application of meteorology to storm and weather predictions.

Between 1850 and 1860 Professor Henry and others frequently urged on Congress and the public the importance and practicability of systematic weather predictions for the benefit of the people. The daily bulletin of weather reports was contributed gratuitously by the telegraph companies to leading newspapers, and individuals are known to have frequently utilized these reports as a basis for weather predictions. In 1842 Espy had been appointed to duty under the Surgeon-General of the United States, with the idea that further developments as to the laws of storms might be deduced from his daily charting of the meteorological observations gathered in that office. His labors in connection with the government are represented by his first, second, third, and fourth reports, published in 1845, 1852, 1854, 1857 respectively, which contained numerous charts of storms in their progress through the country. His labors were, like those of Professor Henry, animated by the hope that Congress would vote the necessary means for the establishment of a bureau of telegraphic weather reports and predictions. This was not realized at that time, owing in part to the incredulity of some as to the possibility of predicting the weather, and in part to the absorbing interest in political questions that threatened the existence of the republic.

During the years 1860-1870 numerous steps in advance were taken by European countries, while in the United States only two events are chronicled: (1) The attempt of the Smithsonian Institution in 1864 to revive the weather chart, which had been interrupted during the Civil War, and which revival was only prevented by the occurrence of a disastrous fire in that institution; (2) the establishment in 1868-1869 at the Observatory of Cincinnati by Prof. Cleveland Abbe of a system of telegraphic reports and daily weather predictions for the benefit and at the expense of the Chamber of Commerce of that city. The Board of Trade of Chicago was invited to share in this undertaking, and a further extension to Milwaukee was proposed by Prof. I. A. Lapham of that city, who, however, at the suggestion of Gen. H. E. Paine, the member of Congress from that district, concluded to again renew before Congress the agitation of the national importance of this subject. The bill introduced by General Paine, accompanied by memorials from boards of trade and by letters from Lapham and others, after some modifications, became a law, Feb. 4, 1870. Under this and subsequent laws the meteorological work, at first conducted by the chief signal officer of the army, has come to be the most extensive and in some respects the most important of that done by any single government office; its growth and success is largely due to the foresight of General Myer, the enthusiasm of General Hazen, and the economy of General Greely. The evident utility and great popularity of the work of the weather bureau proved an immediate stimulus to the development of similar work in Europe, and since 1872 the larger weather bureaus throughout the world have been established, the older and smaller ones have been modified, and meteorology, in place of being considered as a branch of chemistry or physics, or a chapter of statistics, is treated like astronomy, as an independent, well-organized science, whose field of work is quite definite, and whose utility is unquestioned. On July 1, 1891, the United States Weather Bureau was made a branch of the Department of Agriculture. It has over 1,000 employes, and the average of correct forecasts is four out of five. See WEATHER SIGNAL: WIND SIGNALS.

**Weather Fish,** the *Misgurnus fossilis*, called also the mud fish and thunder fish. It is about a foot in length, dark-brown

above, flecked with black; abdomen orange, with black spots. In Germany and Austria it is regarded as a weather prophet, because it usually comes to the surface about 24 hours before bad weather, and moves about with unusual energy. This habit has sometimes led to its being confined in a glass globe as an animated barometer.

**Weather Forecasting.** See METEOROLOGY.

**Weather Signal,** a signal for indicating weather conditions. Five flags are used by the United States Weather Bureau to indicate the temperature and ordinary conditions of the weather. They are numbered 1 to 5, but some are used in couples to form combinations. No. 1 is a perfect white square and indicates "clear or fair weather." No. 2 is all blue, also square, and its meaning is "rain or snow." No. 3 is a black triangle and is called the "temperature signal." It is always used in combination with either the white or blue square. When placed above the white or blue flag it means that the weather will be warmer, and when below, that it will be colder. When it is omitted altogether, the significance is that the temperature will be stationary. Sometimes three flags are used in combination. For example, when the triangular flag is at the top of the pole, with the white square immediately below it, and the blue square below the white, the signal reads "warmer, fair weather, followed by rain or snow." No. 4 is the "cold wave" signal. It is a white square with a black square in the center of the white. It shows up very clearly, and can never be mistaken for anything else. No. 5 indicates "local rains or showers." It is a square flag, of which the upper half is white and the lower blue. See WEATHER BUREAU: WIND SIGNALS.

**Weaver, Aaron Ward,** an American naval officer; born in the District of Columbia, July 1, 1832; was graduated at the United States Naval Academy in 1854; and was promoted lieutenant in 1855. In 1858–1859 he cruised along the African coast in the sloop "Marion," and returned in command of the prize slaver "Ardennes." He served with distinction through the Civil War, participating in numerous engagements; was promoted commander July 25, 1866; captain, Aug. 8, 1876; and rear-admiral, June 27, 1893; and was retired Sept. 26, 1893.

**Weaver, James B.,** an American lawyer; born in Dayton, O., June 12, 1833; was admitted to the bar in 1854; served in the Union army during the Civil War, becoming a Brigadier-General of volunteers. After the war he practised law in Iowa; filled several offices in that State; edited the "Iowa Tribune," published in Des Moines; was a member of Congress in 1879–1881; the Greenback candidate for President of the United States in 1880; again in Congress in 1885–1889; and in 1892 again became a candidate for the presidency, this time on the People's party ticket, receiving 22 electoral votes.

**Weaver Bird,** a popular name for any species of the family *Ploceidæ*. Both the scientific and trivial names of these birds have reference to the remarkable structure of their nests. The weaver birds are large finches, with somewhat elongated bodies, moderate wings, long tails, and very bright coats, the latter often varied in the breeding season. Yellow and yellowish-red are the prevailing tints, but species occur in which black, red, white, or gray predominates. The weaver birds are extremely social, and many of the species live in large colonies during the period of incubation.

WEAVER BIRD AND NEST.

The nests of the various species differ considerably in shape and general structure, some (as the genus *Oriolinus*), building a separate nest for the male, while the female sits in another on her eggs, till relieved by her mate; others again contain more than one chamber, as that of the golden weaver bird, *P. galbula;* while the social weaver birds, *P.* or *Philæterus socius*, construct an umbrella-like roof, under which from 800 to 1,000 separate nests have been found. But in all cases fibers, slender twigs, or blades of grass are the materials employed, the whole being tightly woven, after having been rendered more flexible and adhesive by the application of saliva. The nests themselves consist of a more or less globular portion, elongated into a tube below, with the entrance at the bottom or at the side. They are very generally suspended at the ex-

Weaving

tremities of branches, and often over water, probably as affording security, against monkeys, snakes, and other enemies. The Mahali weaver bird (*P. taha*) is said to insert thorns into its nest, as a further protection against marauders. It is a noteworthy fact that the golden weaver bird has begun to build on the telegraph wires by the side of the railway in Natal, owing to the rapid destruction of the willows before advancing civilization.

**Weaving,** the art of interlacing yarn threads or other filaments by means of a loom, so as to form a web of cloth or other woven fabric. In this process two sets of threads are employed, which traverse the web at right angles to each other. The first set extends from end to end of the web in parallel lines, and is commonly called the warp; while the other set of threads crosses and interlaces with the warp from side to side of the web, and is generally called the weft or woof. In all forms of weaving the warp threads are first set up in the loom, and then the weft threads are worked into the warp, to and fro, by means of a shuttle. It was by this fundamental process of interlacing two sets of thread in looms of simple mechanism that the mummy cloths of Egypt, the fine damasks and tapestries of the Greeks and Romans, the Indian muslins, the shawls of Cashmere, and the famed textile fabrics of Italy and the Netherlands were produced. From the latter countries weaving by means of a hand loom was introduced into England.

This loom consists of a frame of four upright posts braced together by cross beams, the center beam at the back being the warp beam, the beam in front being that on which the web is wound, while just below this, in front, is the breast beam for the support of the weaver at his work. At the top of the loom is an apparatus by which the heddles are lifted or lowered by means of treadles under the foot of the weaver. These heddles consist of two frames, from which depend cords attached by a loop or eye to each thread in the warp. As these threads are attached to the frames, alternately, it follows that when one heddle is raised every second thread in the warp is also raised, while the remaining threads are depressed; and this is called shedding the warp. When the warp threads are thus parted there is left a small opening or shed between the threads, and it is through this opening that the weaver drives his shuttle from side to side. The shuttle, which is hollow in the middle, contains the weft-thread wound round a bobbin or pirn, and as the shuttle is shot across the web this weft thread unwinds itself. When the thread is thus introduced it is necessary to bring it to its place in the fabric. This is accomplished by means of the lay or batten, which is suspended from the top of the loom, and works to and fro like a pendulum by an attachment of vertical rods at each side called the swords. Attached to the lay is what is called the reed, which is a sort of comb having a tooth raised between every two threads of the warp, and so by driving up the lay after a weft thread has been introduced the weaver strikes home that thread to its place in the cloth.

A great improvement was made on the hand loom when John Kay about 1740 invented the fly shuttle, as it was called. This enabled the weaver to drive the shuttle both ways with the right hand by means of a cord attached to a box or trough placed at each end of the shuttle race, which impelled the shuttle to and fro at each jerk of the cord. But the most important improvement was made on the hand loom by Joseph Jacquard of Lyons, who, in 1801, invented an apparatus by which the most intricate patterns could be woven as readily as plain cloth. This is accomplished by an ingenious arrangement of hooks and wires, by means of which the warp threads are lifted in any order and to any extent necessary to make the shedding required by the pattern. The order in which these hooks and wires are successively lifted and lowered is determined by means of a series of pasteboard cards punctured with holes, the holes corresponding to a certain pattern and the cards passing successively over a cylinder or drum. The hooked wires pass through these holes and lift the warp threads in an order which secures that the arranged pattern is woven into the fabric. When the pattern is extensive the machine may be provided with as many as 1,000 hooks and wires.

Another development was made in the art of weaving by the invention of the power loom by the Rev. E. Cartwright in 1784. In the power loom, which has been gradually improved and adapted to steam power, the principal motions of the old method of weaving, such as shedding the warp threads, throwing the shuttle, and beating up the thread, are still retained. The frame of the power loom is of cast iron, and motion is communicated to the loom by means of a shaft, the stroke of the lay being made by cranks attached to the driving shaft, while the shuttle is thrown by means of a lever attachment at the center of the loom. Though the principle of the loom is the same in all kinds of weaving, yet there are numberless modifications for the production of special fabrics. The lappet loom is one suitable for weaving either plain or gauze cloths, and also for putting in representations of flowers, birds, or the like.

Cross weaving is a term applied to that process in which, as in gauze weaving, the warp threads, instead of lying constantly

parallel, cross over or twist around one another, thus forming a plexus or interlacing independent of that produced by the weft. Double weaving consists in weaving two webs simultaneously one above the other, and interweaving the two at intervals so as to form a double cloth. Kidderminster or Scotch carpeting is the chief example of this process. Pile weaving is the process by which fabrics like that of velvets, velveteens, corduroy, and Turkey carpets are produced. In the weaving of these fabrics, besides the ordinary warp and weft, there is what is called the pile warp, the threads of which are left in loops above the surface till cut, and the cutting of which constitutes the pile.

**Webb, Alexander Stewart,** an American educator; born in New York city, Feb. 15, 1835; was graduated at the United States Military Academy in 1855; commissioned 2d lieutenant in the 4th Artillery; entered the Civil War as major of the 1st Rhode Island Infantry, Sept. 14, 1861; served with distinction and was wounded at Gettysburg; was in the Rapidan and Wilderness campaigns; promoted lieutenant-colonel 49th Infantry, July 26, 1866; transferred to the 5th Infantry, March 15, 1869; brevetted Major-General, U. S. V. and U. S. A.; was discharged at his own request, Dec. 3, 1870. He was president of the College of the City of New York in 1869-1903, and wrote: "the Peninsula: McClellan's Campaign of 1862." He died Feb. 12, 1911.

**Webb, Charles Henry** (pen name JOHN PAUL), an American journalist and humorist; born in Rouse's Point, N. Y., Jan. 24, 1834. He went to sea when young. His journalistic work was done on the New York "Times" (1860–1863); the "Evening Bulletin," and the "Californian," San Francisco (1863–1866; the latter he founded); and the New York "Tribune," for which, mainly, his humorous articles were written. He invented an adding machine. He wrote several burlesque dramas: "John Paul's Book" (1874); "Parodies, Prose, and Verse" (1876); "Vagrom Verse" (1889); "More Vagrom Verse" (1901); etc. He died May 24, 1905.

**Webb, James Watson,** an American military officer and diplomatist; born in Claverack, N. Y., Feb. 8, 1802. Having a taste for military life, he obtained a lieutenancy in the artillery; became adjutant in 1825, served for a time under General Scott; resigned from the army, in April, 1827, to take up journalism. He was connected with the "Morning Courier," New York (1827–1829); "The Morning Courier and New York Enquirer" (1829–1859). He was the author of: "Altowan; or, Incidents of Life and Adventure in the Rocky Mountains" (2 vols. 1846); "Slavery and its Tendencies" (1856); and a pamphlet on "National Currency" (1875). He died in New York city, June 7, 1884.

**Webb, Sidney,** an English socialist, one of the founders of the Fabian Society; born in London, England, July 13, 1859; was educated in Switzerland, Germany, Birkbeck Institute, and City of London College; for some time in the civil service; became a barrister in 1885; lectured on political economy at City of London College, Workingmen's College, and London School of Economics and Political Science. He wrote: "Socialism in England" (1889); "The Eight Hours' Day" (1891), in collaboration with Harold Cox; and "The London Program" (1892). His wife, Beatrice (Potter), wrote: "The Coöperative Movement in Great Britain," and together they have written the noted "History of Trades-Unionism in England" and "Industrial Democracy" (1898). "Problems of Modern Industry" appeared in 1898.

**Weber, Carl Maria von** (vā'ber), a German composer; born in Eutin, Germany, Dec. 18, 1786. His father was a musician, and had him carefully educated. He learnt for a time painting and engraving, but music was his passion, and he began to compose at the age of 12. He made various musical tours with his father, and about 1803 visited Vienna, where he became acquainted with the celebrated Haydn and the Abbé Vogler, from whom he received valuable help in his studies. He had now become widely known, and filled successively the offices of chapel-master at Breslau and Carlsruhe, and director of the opera at Prague, making in the meantime other professional journeys in Germany. At the close of 1816 he settled at Dresden, where he was the founder and director of German opera. In 1822 he went to Berlin, to bring out his "Der Freischütz" (The Free-Archer), the most celebrated of his compositions, and which at once gave him rank with the great masters of his art. In 1826 Weber visited London to superintend the production of his "Oberon," which he had composed for Covent Garden Theater, and was brought out, conducted by Weber himself, April 12, 1826. Soon after, unmistakable symptoms of pulmonary disease presented themselves, and the health of the great composer sank rapidly, and his illustrious career closed on June 5, 1826, when he was found lifeless in his bed. Of his other compositions may be named the operas of "Das Waldmädchen" (The Forest Maiden), recast under the titles of "Sylvana," "Rübezahl," and "Euryanthe."

**Weber, Ernst Heinrich,** a German physiologist (1795–1878), was from 1818 till his death a Professor of Anatomy and of Physiology at Leipsic. He was specially

distinguished for his researches on the senses. (See WEBER'S LAW.) WILHELM EDUARD WEBER, physicist (1804–1891), brother of the preceding; in 1831 became Professor of Physics at Göttingen. He was one of the seven professors deposed in 1837 for their protest against the revocation by the king of the liberal constitution. Associated with Gauss in his researches, he was specially distinguished for his contributions to electricity and magnetism. GEORG WEBER, historian (1808–1888), was from 1848 to 1872 director of the Bürgerschule in Heidelberg, and wrote a long series of historical works. Among them are books on Calvinism in Germany, on the Reformation in England, on the period of Reformation, a history of Israel, the origin of Christianity, and a history of literature. He is best known, however, by his "Manual of Universal History" (20th ed. 2 vols. 1888) and his larger "Universal History" (15 vols. 1857–1880; 2d ed. 1882–1890).

**Weber, Karl Julius,** a German author; born in Langenburg, April 16, 1767. He wrote: "Monasticism" (3 vols. 1818–1820); "Knighthood" (3 vols. 1822–1824); "Germany; or, Letters of a German Traveling in Germany" (4 vols. 1826–1828); "Democritus; or, The Literary Remains of a Laughing Philosopher" (5 vols. 1832–1835); the last two works being satires on German society. He died in Kupferzell, July 20, 1832.

**Weber, Max Maria von,** a German railway engineer, son of the celebrated music composer, Karl Maria von W.; born in Dresden, April 25, 1822. Besides numerous technological works, he wrote: "Karl Maria von Weber: A Life Picture" (3 vols. 1864–1866); "From the World of Work" (1868); "Works and Days" (1869); "Looking and Doing" (1878). He died in Berlin, April 18, 1881.

**Weber's Law,** in physiology, that there is always a constant ration between the strength of the stimulus and the intensity of the sensations. The stronger the stimulus already applied, the stronger must be the increase of the stimulus in order to cause a perceptible increase of the sensation.

**Webskyite** (after Professor Websky, of Berlin), an amorphous mineral occurring in the olivine-diabase (palæopicrite), of Amelose, Biedenkopf, Hesse; hardness, 3.0; sp. gr. 1.771; color, pitch-black, in thin splinters, bright-green; streak, brownish-green; composition: A hydrated silicate of magnesia with some iron protoxide. An analysis yielded the formula $H_6R_4Si_3O_{13} + 6H_2O$, where R = Mg and Fe.

**Webster, Albert Falvey,** an American story-writer; born in Boston, Mass., in 1848. His best stories were printed in "Scribner's," "Appleton's," and the "Atlantic Monthly," and include: "Our Friend Sullivan"; "Little Majesty"; "An Operation in Money"; "My Daughter's Watch"; "Miss Eunice's Glove." He died at sea, Dec. 27, 1876.

**Webster, Augusta (Davies),** an English poet and dramatist; born in Poole, Dorsetshire, England, Jan. 30, 1840. She was daughter of Vice-Admiral George Davies. She wrote: "Blanche Lisle and Other Poems, by Cecil Home" (1860); "A Woman Sold," etc. (1867); "Portraits" (1870); "In a Day" (1882); a drama, several metrical dramas, translations of Greek tragedies, etc. She died in Kew, Sept. 5, 1894.

**Webster, Daniel,** an American statesman and orator; born in Salisbury, N. H., Jan. 18, 1782. He was a child of the wilderness, and but for our system of school education, which, even then, pushed the means of instruction into remote solitudes, he would never have been enabled to bring his great faculties to bear in public life. Daniel was the second son of Ebenezer Webster, a small farmer and justice of the county court. He entered Dartmouth College in 1797, and taught school in winter to pay his expenses. He was graduated in 1801, and commenced to study law, but was induced, by an offer of a salary of $350 a year, to become preceptor of an academy at Freburg, Me., paying his board by copying deeds. In 1804, he went to Boston, and entered the law office of Mr. Gore. In 1805 he was admitted to the Boston bar, passed one year in the practice of his profession at Boscawen, and, on the death of his father, established himself at Portsmouth, N. H., and married in 1808.

Having engaged in politics as a member of the Federalist party, he was elected to Congress, where he immediately took rank with the foremost men of the country. He took his seat in the special session of May, 1813, and on June 10, delivered his maiden speech on the repeal of the Berlin and Milan decrees. This, and his mastery of the question of currency and finance, secured him a high position. At the close of the session, however, he removed to Boston, where, during a period of seven years, he devoted himself exclusively to the practice of his profession, and occupied a position as a counsellor and an advocate, above which no one has ever risen in this country. In 1822, he was a member of the Massachusetts Constitutional Convention, and on Dec. 22, 1822, he pronounced at Plymouth on the anniversary of the landing of the Pilgrims, the first of that remarkable series of discourses, or orations, which put him in the first rank among American orators. In 1829, he delivered an oration at the laying of the corner stone of

the Bunker Hill Monument; in 1843, one on its completion. In 1826, he pronounced the eulogy of John Adams and Thomas Jefferson, two fathers and Presidents of the American Republic, who died on the same semi-centenary anniversary of the Declaration of Independence; and in 1851, a patriotic discourse on the laying of the corner stone for the extension of the Capitol at Washington.

In 1822, he was elected to Congress from Boston, and distinguished himself by his speeches on the Holy Alliance, and the Greek revolution, and his labors in the revision of the criminal laws of the United States. In 1826, he was chosen a United States Senator; and in 1830, rose to the height of his forensic renown, in a speech of two days, in the debate with Senator Hayne, of South Carolina, on the right of "nullification." Webster and Clay were the leaders of the opposition during the administration of Jackson and Van Buren. In 1841, he became Secretary of State under President Harrison; remained in the administration of President Taylor till 1843; and was a third time Secretary of State in 1850, in the cabinet of Mr. Fillmore. On various occasions Webster had been an unsuccessful candidate for the presidency. He aspired again to that position in 1852, but his advocacy of compromises on the slavery question had given offense to the Abolitionists, and the choice of the convention assembled at Baltimore fell on Gen. Winfield Scott. The great orator died a few months after, Oct. 24, 1852. Webster's figure was commanding; his countenance was remarkable even in repose, but when animated by the excitement of debate it "spake no less audibly than his words." His gestures were vehement, without being undignified; and his voice was unrivalled in power, in clearness, and in modulated variety of tone. The most complete edition of his works is that published in 1851, in six volumes 8vo.

**Webster, John,** an English dramatist of the first part of the 17th century. He was clerk of the parish of St. Andrew, Holborn, and a member of the Company of Merchant Tailors. His works are: "The White Devil" (1612); "The Devil's Law-Case" (1623); "The Duchess of Malfy" (1623); "Appius and Virginia" (1654); "The Thracian Wonder" (1661); and "A Cure for a Cuckold," a comedy (1661). He also assisted Dekker in writing the "History of Sir Thomas Wyatt," and the comedies "Westward Ho!" and "Northward Ho!" By some critics he is accounted second only to Shakespeare.

**Webster, Noah,** an American lexicographer; born in Hartford, Conn., Oct. 16, 1758. He was graduated at Yale College in 1778, having served in the Revolutionary War in his junior year; was admitted to the bar in 1781, but relinquished it for teaching in 1782; and in 1788 settled in New York as a journalist. Thence he removed to New Haven in 1798, and thence to Amherst in 1812, returning to New Haven in 1822. In 1783–1785 he published his "Grammatical Institute of the English Language," in three parts, "Webster's Spelling Book," "A Plain and Comprehensive Grammar," and "An American Selection of Lessons in Reading and Speaking." All these works had an enormous sale. His literary activity was henceforth very great, the works issued by him during the next few years including important legal and linguistic studies. In 1806 he published an 8vo. English dictionary, which led the way for his great work, the "American Dictionary of the English Language." In preparing this work he visited England, and he finished the dictionary during an eight months' residence in Cambridge. In June, 1825, he returned to America. The first edition of his dictionary was published in 1828 (2 vols. 4to.); it was followed by a second in 1840; since which time a number of editions have appeared, and the work has grown into the greatly improved and enlarged "International Dictionary." He died in New Haven, Conn., May 28, 1843.

**Webster, Sir Richard Everard,** an English jurist; born in England, Dec. 22, 1842; was educated at the University of Cambridge, and called to the bar in 1868. He became one of the most eminent lawyers in England, and a queen's counsel in 1878. He was Attorney-General during the administrations of Lord Salisbury in 1885–1886 and 1886-1892; was elected to Parliament from Launceston in 1885, and for many years represented the Isle of Wight; and was one of the British representatives before the Bering Sea Arbitration Tribunal in 1893. In 1900 he was raised to the peerage as 1st Baron Alverstone.

**Weckherlin, Georg Rudolf** (vek'hārlēn), a German poet; born in Stuttgart, about 1584. He was essentially a court poet, and wrote only for the nobility. He was the first to introduce into German literature the ode, sonnet, eclogue, and epigram; his finest pieces are the "Love Songs to Myrta." He had his complete poetical works published twice at Amsterdam (2 vols. 1641, 1648). He died in London, about 1653.

**Wedderburn, Alexander,** a Lord Chancellor of England, ennobled as Lord Loughborough and Earl of Rosslyn; born in Edinburgh, Scotland, Feb. 13, 1733; the son of a Scotch judge. He passed as advocate, but was called to the English bar in 1757. He entered Parliament in 1762, took part in the great Douglas cause, and in 1771 left the opposition to become a strenuous supporter

of Lord North as solicitor-general. He supported the American war policy, and was made chief-justice as Lord Loughborough (1780); but in 1784, disappointed of the chancellorship, passed over to Fox, and sought favor with the Prince of Wales. Insinuating and unscrupulous, he next made friends with Pitt, by whom he was made Lord Chancellor (1793), but to whom he played false. Addington gave him his earldom (1801). He died near Windsor, Jan. 2, 1805.

**Wedderburn, James,** a Scotch psalmodist; born in Dundee, Scotland, about 1500. With his brother Robert, he edited: "Ane Compendious Buike of Godly and Spirituall Sangs, Collectit Out of Sundrie Partes of the Scripture, wyth Sundrie of Uther Ballates Changed Out of Prophane Sangs, for Avoyding of Sinne and Harlotrie" (about 1548). This was the principal psalmbook used in Scotland. He is the reputed author of "The Complaynt of Scotland" (1548), "the only classic work in old Scotch prose." He died in England, about 1564.

**Wedding Ceremonies,** a variety of customs that doubtless arose by degrees and in different ways; and often when the mode of contracting a marriage altered, the earlier mode survived as a ceremony. Thus, for example, the system of capture was transformed into a mere symbol after purchase was introduced as the legal form of contracting a marriage, and again the custom of purchase has survived as a ceremony after it has ceased to be a reality. Marriage being a matter of some importance naturally begot ceremonial — symbolical of sexual intercourse, or of living together, or of the wife's subjection to the husband. And naturally religious rites would be added to give sanction — prayers, sacrifices to appease the gods. There was no religious contract among the ancient Hebrews, and there is no trace of priestly consecration in the Scriptures or the Talmud. Under Christianity a religious character came early to be given to the rite, though the early Church, like the Buddhists, regarded marriage as little more than a concession to human weakness. The notion that marriage is a sacrament grew naturally out of St. Paul's phrase, "This is a great mystery" (Eph. v: 32), for the Vulgate translation renders *μυστήριον* by "sacramentum."

One of the most wide-spread rites of marriage is that of the man and woman eating out of the one dish, as we see it, for example, all over the Malay Peninsula, and elsewhere. Among the Romans three forms of marriage prayers, sacrifices, and auspices were essential only in the *confarreatio*, not in the *coemptio* and *usus*. In the first of these, the old patrician mode, the chief ceremony was the offering of a cake of spelt, made to Jupiter in the presence of the *pontifex* and *flamen Dialis* with 10 witnesses. The *coemptio* again was a symbolic sale in which the father delivered his daughter to her husband as a piece of property, she at the same time declaring her consent. In the betrothal the bridegroom gave the bride earnest-money, as in other cases of contract, or a ring in its stead. The *usus* resembled the English handfasting, the only thing required being that the woman should live a year in the man's house without absenting herself from his bed for three nights.

Our modern "best man" is no doubt the survival of the bridegroom's best helper in the act of capture. In the good old times there were many hearty wedding customs now considered almost as indecorous as Squire Western's jokes would be, such as the struggle for the bride's garters, the drinking of healths in the bridal chamber, the singing of boisterous and appropriate songs outside the door, and the like. The throwing of rice is not an indigenous English custom, and has displaced the strewing of herbs, flowers, and rushes on the way to church. The giving of garlands, gloves, and the like has fallen into disuse; but knots and favors are still used symbolic of indissolubility; and the ring and bride's cake retain their place, oldest and most universal of our wedding customs. The wedding feast was sometimes protracted for a week, and it was formerly the universal custom among the poor for the guests to bring contributions of all kinds in what were called penny weddings, so that the young couple not only saved the expense of the feast, but had something over on which to begin housekeeping. The modern custom of giving presents is a survival of a time when such were more immediately useful than they now often are. Great pains used to be taken to select a favorable day — the importance of this we see in the dislike to May, or again in the Bedouin preference for Friday, the Chinese for spring or the last month of the year. In olden times the actual sale of wives was not unknown in England, and we are told that the second Duke of Chandos bought his second wife in 1744 from her husband, an ostler in Newbury, who was offering her for sale as the duke passed through the town.

**Wedelia** (named after George Wolfgang Wedel, a German botanist), a genus of *Heliopsideæ;* herbs or undershrubs with serrate or three-cleft leaves and yellow radiate and composite flowers, with a pappus of toothed or hairy scales. Natives of America. The leaves of *W. calendulacea*, a composite with a slight camphoraceous smell, are used in India as a hair dye and to promote the growth of hair. In Lohardagga, in Bengal, the root is pounded, and gives a black dye with salts of iron. The leaves are considered to be tonic and alter-

ative; the seeds, flowers, and leaves in decoction are deobstruent.

**Wedge,** a piece of wood or metal, thick at one end and tapering to a thin edge at the other. It is a body contained under two triangular and three rectangular surfaces. The wedge is one of the mechanical powers, and is used for splitting wood, rocks, etc., for exerting great pressure, as in the oil-press, and for raising immense weights, as when a ship is raised by wedges driven under the keel. All cutting and penetrating instruments, as knives, swords, chisels, razors, axes, nails, pins, needles, etc., may be considered as wedges, the angle of the wedge being in such cases more or less acute, according to the purpose for which it is intended. The mechanical power of the wedge is increased by making the angle of penetration more acute. But no certain theory can be laid down concerning the power of the wedge, since being usually produced by the percussion of a hammer, mallet, etc., every stroke of which causes a tremor in the wedge, the resistance at the sides is for the instant thrown off.

The thin (or small) end of the wedge is a term used figuratively to express the first move, apparently of little importance, but destined or calculated ultimately to lead to important results.

**Wedge-tailed Eagle,** the *Uraëtus audax,* from Australia. Back and sides rust-color, rest of body blackish-brown; feathers of wings and upper tail coverts tipped with pale-brown.

**Wedgwood, Josiah,** an English potter; born in Burslem, Staffordshire, England, July 12, 1730. He received little education, and went to work in his brother's factory at the age of 11. An incurable lameness, the result of smallpox, which subsequently compelled him to have his right leg amputated, forced him to give up the potter's wheel. He removed for a time to Stoke, where he entered into partnership with persons in his own trade, and where his talent for ornamental pottery was first displayed. Returning in 1759 to Burslem, he set up a small manufactory of his own, in which he made a variety of fancy articles. His business improving, he turned his attention to white stoneware, and to the cream-colored ware for which he became famous; and he succeeded in producing a ware so hard and durable as to render works of art produced in it almost indestructible. His reproduction of the Portland Vase is famous. He also executed paintings on pottery without the artificial gloss so detrimental to the effect of superior work (see Wedgwood Ware). His improvements in pottery created the great trade of the Staffordshire potteries. He died in Etruria, near Newcastle-under-Lyme, Jan. 3, 1795. See Pottery.

**Wedgwood Pyrometer,** in physics, a pyrometer in which temperature was ascertained by the contraction of baked clay, measured before and after its subjection to the action of heat. It was not trustworthy, for clay exposed for a long period to a moderate amount of heat will be as much reduced in bulk as by an intensely high temperature continued for a brief period.

**Wedgwood Ware,** a peculiar kind of English pottery ware made by Josiah Wedgwood (*q. v.*), in which artistic designs and treatment were joined to mechanical and technical excellence. Professor Church thus enumerates the several varieties or "bodies" of the ware in the order of invention or improvement: (1) Cream-colored ware, called Queen's ware, in various hues of cream-color, saffron, and straw. (2) Egyptian black, or basaltes ware, used for seals, plaques, life-size busts, medallion portraits, etc. (3) Red ware, or Russo antico, not equal in quality of color or fineness of grain to the earlier work of John Philip Elers, of Bradwell Wood, England. (4) White semi-porcelain, or fine stoneware, differing from the white jasper in its pale straw-colored or grayish hue, and in its waxlike smooth surface and sub-translucency. (5) Variegated ware, of two kinds, one a cream-colored body, marbled, mottled, or spangled with divers colors upon the surface and under the glaze; the other an improved kind of agate ware, in which the colored clays in bands, twists, stripes, and waves constituted the entire substance. (6) Jasper ware, in which the chief triumphs of Wedgwood were wrought, resembling outwardly the finest of his white terra-cotta and semi-porcelain bodies. One of his earliest recipes for this last-named ware was, in percentage, barytes, 57.1; clay, 28.6; flint, 9.5; barium carbonate, 4.8; the novelty of these components being the use of the barytes and barium carbonate. A very little cobalt was occasionally added, even to the white jasper ware, to neutralize the yellowish hue, and by introducing a little Cornish stone or other felspathic material it became less opaque and more wax-like.

There are seven colors in this ware besides the white — blue of various shades, lilac, pink, sage-green, olive-green, yellow, and black — and it is remarkable for the absence of bubbles and holes, the flatness of the field, and the uniformity of grain. It was produced in numberless forms — cameos, intaglios, portrait medallions, statuettes, vases, etc., and the yellow variety is rare. Wedgwood's artistic work consists not only in copies of antique gems and in the adaptation of antique designs, but in the original productions of many English and foreign draughtsmen and modelers; foremost among the former must be placed the great artist Flaxman. His chief mark is the

name "Wedgwood," impressed in Roman characters in the paste before firing, the size of the letters ranging from ¼ to $\frac{1}{32}$ of an inch in height. During his partnership with Bentley the name of the latter was conjoined to his own. In some cases the word "Etruria" is added. The name "Josiah Wedgwood," with a date deneath, belongs to a time when the works at Etruria — now a town of about 5,000 inhabitants — were carried on by the son of the founder; in more recent times the simple name "Wedgwood" has been reverted to. Small marks, chifly those of workmen, are found on pieces of old Wedgwood ware; Miss Meteyard gives no fewer than 100 of these, but Wedgwood — like too many other manufacturers, both past and present — suppressed as far as possible such indications of the individuality of his designers.

**Wedmore,** a parish in Somersetshire, England; lying on a S. slope of the Mendip Hills, 8 miles W. N. W. of Wells; has an interesting 14th century church, with fragments of early sculptures resembling those of the nave of Wells cathedral. But older than its church is an underground chamber, discovered in 1878 in a field called the "Court Garden" which, probably marking the site of Alfred's palace, carries us back to the peace of Wedmore, concluded in 878 between Alfred and Guthrum of East Anglia. By this, "the culminating event of Alfred's reign," following as it did his defeat of the Danes at Ethandun, the Northmen agreed to evacuate Wessex and the part of Mercia S. W. of Watling Street, England being thus divided into *Englalagu* and *Dena-lagu,* while their king was baptized at Aller in the font recently restored to Aller Church, and from *Guth-orm,* "the fighting dragon," became *Æthel-stán,* "the stone of excellence." On August 7, 1878, the millenary of the peace was celebrated at Wedmore, and reference may here be made to the reports of the Somersetshire Archælogical Society for the speeches of Bishop Clifford and others on that occasion, as also to Professor Earle's "Peace of Wedmore, and how it touches the History of the English Language" (1878).

**Wedmore, Frederick,** an English journalist and art critic; born in Clifton, England, July 9, 1844. He wrote considerably for the magazines and was art critic of the "Standard." Among his works are: "A Snapt Gold Ring" (1871), a novel; "Two Girls" (1874); "Studies in English Art" (1876); "Pastorals of France" (1877); "Four Masters of Etching" (1883); etc.

**Wednesbury,** locally WEDGEBURY, an English municipal and parliamentary borough in the S. of Staffordshire; 8 miles N. W. of Birmingham. Crowning a hill at the N. end of the town is the cruciform Perpendicular Church of St. Bartholomew, supposed to occupy the site of a temple of Woden — hence the Anglo-Saxon name, Wodnesbeorh. It seems to have been built in the 11th, and rebuilt in the 15th century, and was much altered and restored between 1766 and 1885. Here, too, in 916 the Princess Ethelfleda, Edward the Elder's sister, founded a castle. Modern buildings are the town hall (1872), public baths, and free library (1878), and art gallery and museum (1891), with a collection of modern paintings, the gift of a local benefactor, valued at $50,000. One of the great iron towns of the Black Country, in a district abounding in coalpits, ironworks, railways, and canals, Wednesbury has manufactures of boiler-plates, bar iron, steel, railway ironwork, gas and steam tubes, edge tools, etc.

**Wednesday,** the name of the fourth day of the week (in Latin, *dies Mercurii,* day of Mercury), derived from the old Scandinavian deity Odin or Woden.

**Weech, Friedrich von** (vā*h*), a German historian; born in Munich, Oct. 16, 1837. He wrote: "The Emperor Ludwig of Bavaria and King John of Bohemia" (1860); "Baden under the Grand-Dukes Karl Friedrich, Karl, and Ludwig" (1864); "History of the Baden Constitution" (1868); "The Germans since the Reformation" (1878); "History of Baden" (1890); "Karlsruhe: History of the City" (1893).

**Weed,** a popular name for any sudden illness, cold, or relapse with febrile symptoms in women after confinement or nursing, especially milk fever and inflammation of the breasts. In horses weed, or shot of grease (*Lymphangitis*), consists in inflammation of the large absorbent glands and vessels situated between the horse's thighs, occurring particularly after a day or two of rest, after exposure to cold, or during imperfect action of the bowels.

**Weed,** the name given to each of those plants which grow wild in cultivated grounds, and injure the crops; which they do both by choking them and by exhausting the soil. Those weeds which are annuals or biennials, as charlock, yellow rattle, and melilot, may gradually be got rid of by merely cultivating, for a succession of years, such plants as are to be cut before the seeds of the weeds are fully ripe. Perennial weeds, such as couch-grass, can only be removed from the ground by repeated and careful tilling; and for this purpose crops which require much hoeing are advantageously planted, and recourse is had to summer fallowing in fields, and frequent weeding in gardens. Thistles and other large weeds are frequently pulled in cornfields before the corn comes into ear, and to

prevent their seeding they are cut in pastures. Sedges and rushes, which spring up in great abundance in damp grounds, disappear on thorough draining. Leafy crops which thickly cover the soil prevent the growth of many weeds by the exclusion of air and light. Weeds which have been rooted up form excellent compost for manure. Those which make their appearance in fallow grounds serve for green manuring when they are plowed down. Cultivated grasses growing in arable fields are weeds there. The seeds of weeds are carried normally by the wind, but may be conveyed by running streams. Weeds are often sown along with crops, the seed being imperfectly cleaned; and they are often spread by manure, conveyed by the droppings of birds, or in the mud clinging to the feet of men and animals. Weeds spread far and near from ill-cleaned hedge rows. Weeds transferred to new countries sometimes grow more luxuriantly than at home; thus the anacharis from America almost chokes up ditches and canals in England, and the thistle from Great Britain is a ruinous pest in some parts of Australia.

**Weed, Stephen Hinsdale,** an American military officer; born in New York city in 1834; was graduated at the United States Military Academy in 1854, and was assigned to duty in the artillery; served in Texas and Florida in 1856–1857; was on frontier duty in Kansas and Utah in 1858–1860, and took part against hostile Indians; was promoted captain in May, 1861; and had command of a battery in the Maryland, Peninsular, and Northern Virginia campaigns; was chief of artillery in Falmouth, Va., in 1862–1863; promoted Brigadier-General of volunteers for conspicuous gallantry at the battle of Chancellorsville. During the battle of Gettysburg, while holding back the Confederates from an important point on Little Round Top, he was fatally shot, but exclaimed as he fell "I would rather die here than that the rebels should gain an inch of ground." The position was afterward named "Weed's Hill." General Weed died near Gettysburg, July 2, 1863.

**Weed, Thurlow,** an American journalist; born in Cairo, N. Y., Nov. 15, 1797; was employed as a lad in several printing offices; served as a private in the War of 1812; and afterward edited newspapers in Western New York, till in 1830 he founded the Albany "Evening Journal," an anti-Jackson, Whig, or Republican paper, which became the organ of the party, and which he controlled for 35 years. He was a leading party manager in State and National politics in 1824–1876, exercising almost supreme influence in nominations and appointments, while declining all offices for himself. He was influential in nominating Harrison in 1836 and 1840, Clay in 1844, Taylor in 1848, and Scott in 1852; with Seward and Greeley controlled New York; supported Lincoln and the Civil War; and went for him on a mission to Europe in 1861–1862. In 1867–1868 he was editor of the New York "Commercial Advertiser." He wrote: "Letters from Europe and the West Indies" (1866); "Reminiscences" (in "Atlantic Monthly," 1870); "Autobiography" (1884). He died in New York city, Nov. 22, 1882.

**Weed, Walter Harvey,** an American geologist; born in St. Louis, May 1, 1862; was graduated at the Columbia School of Mines in 1883; and was then appointed geologist on the United States Geological Survey. In 1883–1889 he was on the geological survey of the Yellowstone Park. He discovered that colors in hot springs and deposits in geysers are caused by algæ. He also discovered Death Gulch in that park where bears, elk, etc., are killed by inhaling carbon dioxide gas emitted from an extinct hot spring. In 1889–1898 he was engaged on a general geological exploration of Montana, and made important discoveries. In 1899 he brought out the first published theory of secondary enrichment of ore deposits. He was the author of "Formation of Hot Springs Deposits"; "Laramie and Livingston Formations"; "Glaciation of Yellowstone Park"; "Geology of Castle Mountain District"; "Geology of Bear Paw Mountains"; "Secondary Enrichment of Mineral Veins"; etc.

**Weeden, William Babcock,** an American military officer; born in Bristol, R. I., Sept. 1, 1834; studied at Brown University and then engaged in the manufacture of woolen goods in Providence. In 1861 he joined the Union army as 2d lieutenant in the 1st Rhode Island Battery; served at the front for three years; promoted captain; was present during the siege of Yorktown, and took part in the engagements at Hanover Courthouse, Mechanicsville, Gaines's Mill, and Malvern Hill. After his resignation he resumed business. His publications include: "Morality of Prohibitory Liquor Laws" (1875); "Social Law of Labor" (1882); "Economic and Social History of New England, 1620–1789" (1890).

**Weehawken,** a town in Hudson co., N. J.; on the Hudson river and on the West Shore, and the New York, Ontario and Western railroads; opposite New York city. It contains a public and parochial school, and has two large reservoirs belonging to the Hackensack Water Company. It is said to be the largest coal shipping depot in the United States. Here are the coal docks of the Erie and Pennsylvania Railroad Companies and those of the Delaware and Hud-

son Canal Company. The assessed property valuation is about $4,500,000. Pop. (1900) 5,325; (1910) 11,228. Weehawken is celebrated as the dueling ground of Alexander Hamilton and Aaron Burr.

**Week,** the space of seven days; the space from one Sunday, Monday, etc., to another; the most obvious and convenient division of the natural or lunar month. The division of time into weeks did not exist among the aborigines of America when the New World was discovered, nor did it exist among the Polynesians, the Japanese, or, it is now believed, the Chinese. It is nearly universal in India, and was found thoroughly rooted when the first Christians went to that country. So has it been from a period of high antiquity in Scandinavia, the names of the several days being connected with identically the same planets in the two regions; so that, if at noon on Sunday in Sweden one could be transported in a moment to India, he would find it Aditwar (=Sunday) there, and so of any other day in the week. The Hebrews, and it is thought the other Semites, had the institution of weeks, the days apparently being simply numbered first, second, third, etc. During the early centuries of their history the Greeks and the Romans had not the institution of weeks, there having been ancient forgery in connection with Homer's oft-quoted passages on the subject. Dion Cassius, in the 2d century after Christ, considered that the week with the planetary names of the days had been introduced into Rome only recently, and from Egypt. The establishment of Christianity under Constantine confirmed the change, and thence the septenary division of time spread to the whole Christian, and subsequently to the Mohammedan world. One school of theologians attributes the wide prevalence of septenary institutions to the Sabbath having been divinely instituted at the Creation; another regards the week as a fourth part of a lunar month. Also, applied to the week days, or working days, as opposed to Sundays.

In Scripture: In Gen. ii: 2, 3, the reason why the division of time into weeks began is stated to be that God occupied six days in the work of creation, and rested on the seventh day, which He consequently hallowed. Seven from this time forth constantly occurs, and obviously becomes a sacred number. (Gen. iv: 15, vii: 2, xxi: 28, xxix: 18, 20, xxxiii: 3, etc.) Traces of division of time into weeks appear in Gen. vii: 4, viii, 10, 12, etc., till the SABBATH (*q. v.*) is mentioned by name (Exod. xvi: 23, 26). A week of weeks (=49 days) was also recognized. The first day of the seventh month was a Sabbath (Lev. xxiii: 24), and the whole month was somewhat sacred, being little more than a succession of feasts and Sabbaths (verses 27, 28, 34, 39, etc.). The seventh year was sacred, the very land obtaining Sabbatic rest (Exod. xxiii: 11, Lev. xxv: 1–7, Deut. xv: 9, 12); and after seven times seven years came the JUBILEE (*q. v.*) (Lev. xxv: 8–55).

Seventy, as having seven for one of its factors, was sacred (Exod. xxiv: 1), and 70 weeks constituted a prophetic period (Dan. ix: 24–27). Feast of Weeks, in Jewish antiquity, a name for the Feast of Pentecost (Deut. xvi: 9, 10). Passion week, the same as HOLY WEEK (*q. v.*). Sometimes, and more correctly, applied to the week which begins with the fifth Sunday in Lent, because on that day the more solemn commemoration of the Passion begins. This (or that) day week, on the same day a week previously or afterward; on the corresponding day in the preceding or succeeding week.

**Weeks, Edwin Lord,** an American artist; born in Boston, Mass., in 1849. He is represented in the Corcoran Gallery, Washington, and in the Pennsylvania Academy of Fine Arts, Philadelphia. He wrote: "From the Black Sea through Persia and India"; etc. He died Nov. 17, 1903.

**Weeping Cross,** a cross, often of stone, erected on or by the side of a highway, where penitents particularly offered their devotions. To return (or come home) by Weeping Cross meant to meet with a painful defeat in any enterprise; to be worsted; to repent sorrowfully for having taken a certain course or having engaged in a particular undertaking.

**Weeping Trees,** a name given to certain trees having drooping secondary branches and remarkably long and pendulous branchlets, in consequence of which they possess a peculiarly graceful appearance, and form a pleasing contrast to trees of normal habit. For this reason and for shade weeping trees are often planted as embellishments of gardens and pleasure grounds, the custom not being confined to Western nations, but much in vogue also among the Chinese and their neighbors. The weeping willow is a general favorite, and in this species the habit is constant; but the weeping forms of British willows, ash, and elm are casual sports, and are propagated by grafts, etc. The weeping birch is not uncommon in a state of nature among the Scotch hills.

**Weever,** the popular name of two European fishes: *Trachinus draco,* the greater, and *T. vipera,* the lesser weever. The first which is the rarer of the two, is from 12 to 18 inches long, and an excellent food fish; the second, which is from four to five inches long, is common on the coasts of the English channel. These fish have the power of inflicting painful wounds with their dorsal and opercular spines. No special organ for

the secretion of poison has been found, but the mucus in the vicinity of the spines has decidedly poisonous properties. The dorsal spine and the spine on the operculum have a deep double groove in which the mucus lodges, and by which it is introduced into punctured wounds. In France, the fishermen are required, under a penalty, to cut off the spines of weevers before selling them.

**Weevil,** a popular name for a large number of beetles, marked by the prolongation of the anterior part of the head into a beak or proboscis, generally used by the females as an ovipositor, and by both sexes as a boring organ. They were formerly ranked in one family *Curculionidæ,* but Le Conte constituted them a special group with the title rhynchophora, and divided them into several families — *Curculionidæ, Scolytidæ, Brenthidæ,* and *Anthribidæ.* According to some authorities there are about 30,000 species; and most would allow at least half that number. With few exceptions the footless grubs are destructive to plants. The *Curculionidæ* are compact weevils, with very hard wing covers, and with a downward-pointing beak or proboscis, bearing the antennæ on its sides and the mouth parts at its end. Their scales are often very brilliant. With few exceptions they devour plants — roots, stems, leaves, fruits, seeds, or, in fact, any part.

Among the 10,000 described species are: *Calandra granaria,* whose larvæ feed on stored grain; *C. oryzæ,* attacking rice, wheat, and maize; various species of *Rhynchophorus,* whose large, fleshy, white larvæ, known as palm grubs, or *grugru,* are sometimes eaten; *Balaninus,* whose mandibles, unlike those of other beetles, move vertically, whose larvæ are hatched in chestnuts, hazel nuts, acorns, and the like; *Trichobaris trinotata,* a little black weevil, which destroys potatoes in America; *Anthonomus pomorum,* often destroying apple blossom in Great Britain; *Conotrachelus nenuphar,* which lays its eggs in nectarine, plum, apricot, peach, and other stone fruit, and is a great pest in the United States; *Cionus scrophulariæ,* whose larvæ spin cocoons remarkably similar to the capsules of *Scrophularia nodosa,* which the insect usually infests; *Pissodes,* whose larvæ attack pines; *Phytonomus punctatus,* a clover weevil, introduced from Europe into the United States; *Entimus imperialis,* the diamond beetle, with very brilliant scales. Species of the likewise brilliant *Rhynchites* attack fruit trees; species of *Apion* especially affect vetches; and those of *Larinus* infest *Compositæ.*

The *Scolytidæ* are very small weevils, some almost microscopic, which, both as larvæ and as adults, bore in wood and bark of trees, especially *Coniferæ,* and occasionally attack herbaceous plants. The *Brenthidæ* are much elongated weevils, mostly tropical, usually infesting bark, and notable for the combats of the rival males, which are larger and better armed than their mates. *Brenthus* and *Eupsalis* are representative genera. Among the *Anthribidæ Cratoparis lunatus,* common in the Eastern United States, feeds on the fungi of dead trees; and the larvæ of *Brachytarsus* are even more aberrant in their habit, for they are parasitic on female coccus-insects. The seed-inhabiting "weevils" or *Bruchidæ,* which do much damage to the seeds of leguminous plants, within which the larvæ hatch and pupate, were excluded by Le Conte from his group *Rhynchophora,* and placed near the *Chrysomelidæ.* Both in Europe and the United States *Bruchus pisi, B. rufimanus,* etc., are destructive to peas and beans, but the common pea weevil in England is *Sitones lineatus,* one of the *Curculionidæ.*

**Wegele, Franz Xaver** (vā′ge-luh), a German historian; born in Munich, Oct. 28, 1823. He was appointed Professor of History in the University of Würzburg in 1851. He wrote: "Karl August of Weimar" (1850); "Life and Works of Dante Alighieri" (3d ed. 1879); "Sources of Thuringian History" (1854); "Frederick the Peaceful, Margrave of Meissen" (1870) "Goethe as a Historian" (1875); "History of German Historiography since the Rise of Humanism" (1885).

**Wegscheider, Julius August Ludwig** (vāg-shī-der), a German theological writer; born in Kübbelingen, Brunswick, Sept. 17, 1771. His principal work is "Institutes of Christian Dogmatic Theology" (1815): this work may be regarded as the classical dogmatic treatise of rationalism. He died in Halle, Jan. 27, 1849.

**Wehl, Feodor von** (vāl), a German novelist and poet; born in Kunzendorf, Silesia, Feb. 19, 1821. He wrote the lyrico-dramatic poem "Hölderlin's Love" (1852); a volume of verses, "From Heart to Heart" (1867); "Fifteen Years in the Directorship of the Stuttgart Court Theater" (1886). His plays were published in six volumes, 1882. He wrote also: "Hamburg's Literary Life in the 18th Century" (1856); "In Leisure Hours" (1867); "At the Roaring Loom of Time" (1869); "Time and Men" (1889). He died in Hamburg, Jan. 22, 1890.

**Wehle, Charles,** an Austrian composer and pianist; born in Prague, in 1822. Thalberg, the famous pianist, first discovered his musical talents, and recommended him to abandon his design of becoming a tradesman. He studied at Leipsic and Berlin, and then went to Paris. Among his musical compositions are "The Bohemians,"

"The Cossack March," "A Bohemian Fête," and a grand sonata for the piano. He died in 1887.

**Wehrlite** (after A. Wehrle, who analyzed the mineral named), a mineral resembling tetradymite. Crystallization, hexagonal; hardness, 1–2; sp. gr. 8.44; luster, bright metallic; color, light steel-gray. An analysis yielded: Tellurium, 29.74; sulphur, 2.33; bismuth, 61.15; silver, 2.07 = 95.29, which yields the formula, Bi(Te,S). Found at Deutsch Pilsen, Hungary.

**Weidner, Revere Franklin,** an American theolgian; born in Center Valley, Pa., Nov. 22, 1851; was graduated at Muhlenberg College, Allentown, Pa., 1869, and at the Lutheran Theological Seminary, Philadelphia, in 1873; was ordained in the Lutheran Church; Professor of Dogmatics and Exegesis at Augustana Theological Seminary, Rock Island, in 1882–1891. In the latter year he became president and Professor of Dogmatic Theology at the Chicago Lutheran Theological Seminary. His publications include: "Commentary on the Gospel of Mark" (1881); "Theological Encyclopædia and Methodology" (3 vols. 1885–1891); "Biblical Theology of the Old Testament" (1886); "An Introductory New Testament Greek Method" (1889); "Biblical Theology of the New Testament" (1891); "Examination Questions in Church History and Christian Archæology" (1893); "Annotations on the General Epistles" (1897); etc.

**Weighing Machine,** a machine for ascertaining the weight of any object; a common balance, a spring balance, a steelyard, or the like. The term is, however, generally applied to machines which are employed to ascertain the weight of heavy bodies, such as those used for determining the weight of loaded vehicles, machines for weighing cattle, or heavy goods, such as large casks, bales, or the like. Some are constructed on the principle of the lever or steelyard, others on that of a combination of levers, and others on that of the spring balance. The term also applies to an automatic device that will register the weight of a person standing on a platform after a coin has been dropped into a receptacle through an opening called a slot.

**Weight,** the force with which a given body is attracted to the earth, and is, in accordance with Newton's Second Law, measured by the product of the mass into the acceleration. For all bodies at the same distance from the earth's center the acceleration is the same; and hence the weight is simply proportional to the mass. Consequently we may compare masses by comparing their weights; and this is really what is done in all operations of weighing. Thus, if two masses are suspended at the extremities of an equal-armed lever, the lever is in equilibrium; hence the weights acting at the extremities, and therefore the masses, must be equal. This is the principal of the ordinary balance. The weight of a mass may also be estimated by means of a spring balance.

**Weights and Measures.** Of the earliest standards of length the principal were the palm or handbreadth, the foot, and the cubit (from elbow to tip of mid-finger). There were two leading cubits: the natural cubit in Egypt, Chaldea, Phœnicia, and Greece = 6 palms = 2 spans = 1½ foot = 18.24 inches; and the royal cubit of Memphis, found also in Babylonia and Chaldea = 20.67 inches. The Greek foot (= 12.16 inches) passed into Italy and was there divided into 12 unciæ (inches); it was afterward shortened, becoming as small as 11.65 inches. The Romans used a 3-foot ulna. The Saxons used an ell or yard of 36 inches, based on the Roman foot. This was continued by the Normans in England, various modifications occurring in the ell. Henry VII. and Elizabeth made standard yards of 36 inches: Henry's was 35.963 inches of the present standard; Elizabeth's was about $\frac{1}{100}$ inch short of the present yard. In 1742 the Royal Society of London made a standard 42-inch scale; in 1760 Mr. Bird made for a Weights and Measures Committee of the House of Commons a copy of an old yard measure found in the Tower. In 1824 (5 Geo. IV. chap. 74) this copy was legalized as the standard yard, with the direction that in the event of its being lost, the standard was to be recovered by making the length of a mean-time seconds pendulum in the latitude of London, in a vacuum at sea-level equal to 39.1393 inches. In 1834 the standard was destroyed in the fire at the Houses of Parliament. In 1838 a committee was appointed under Mr. Airy, astronomer royal; in 1841 they reported against the accuracy of the pendulum method; in 1843 they were appointed as a commission to restore the lost standards; this they did between 1843 and 1854 by taking the best secondary evidence, and they produced a standard bar of gun metal, the distance between two lines on which, crossing two gold studs, is one yard, at 62° F. and 30 inch bar. pressure. This was legalized as the standard by 18 and 19 Vict. chap. 72. The weights and Measures Act of 1878 (41 and 42 Vict. chap. 49.) regulates the law, renders all old local or customary weights and measures, other than imperial ones, illegal, and enacts penalties on false and unverified weights and measures varying from $25 to $250.

Two-thirds of a cubit, we have seen, made a "foot;" a cubic "foot" of water weighed

a talent. When the "foot" was ⅔ the royal cubit, the talent was 655,566 grains; this was the Egyptian, Hebrew, and Olympic monetary talent, later known as the great Alexandrian talent of brass and the Egypto-Roman talent. A talent half this weight was known as the Alexandrian talent of silver, or 327,783 grains; this was divided into 60 minas of 5,463 grains each; these are the origin of the Saxon moneyer's pound of 5,400 grains = Mint pound or Tower pound = old apothecaries pound of Germany; one such pound, in silver coins, was the original form of "one £ sterling," and was divided into 20 "shillings," or 240 "pence" or pennyweights; each pennyweight was divided into 32 monetary grains (wheat grains), each equal to 0.703125 modern grain. The Tower weight was abolished in 1527. The Saxon ounce contained 416.5 grains = nearly, Roman uncia = $\frac{1}{12}$ libra; the libra (= 5,015 grains) was the Greek-Asiatic and Persian mina of 5,015 grains. The Troy pound is 5,760 grains = 12 ounces of 20 pennyweights each. Troy weight is now restricted to gold, silver, and jewels, except diamonds and pearls; the latter are weighed in carats (= 3.1683 grains), which were originally $\frac{1}{144}$ the Alexandrian ounce (the twelfth part of the mina of silver). Various larger pounds were early used for merchandise; in 1303 the "avoirdupois" pound (= 7,000 grains) was in use. The Troy pound standard made by Mr. Bird in 1758 for the Weights and Measures Committee was legalized in 1824; in 1834 the standard was destroyed; the Standards Commission replaced troy weight by avoirdupois, and the standard pound is a mass of platinum weighing 7,000 grains *in vacuo*, copies of which are distributed as in the case of standards of length. The standard of capacity is the gallon, which was in 1824 adjusted so as to contain 70,000 grains, or 10 pounds avoirdupois of water at 62° F. and 30 inches bar. pressure; this gallon occupying 227.274 cubic inches, instead of the old Winchester gallon of 274¼ cubic inches. The French or metric system of weights and measures is based on the decimal system. (See METRIC SYSTEM.) The metric system was legalized in the United States on July 28, 1866, when Congress enacted as follows:

"The tables in the schedule hereto annexed shall be recognized in the construction of contracts, and in all legal proceedings, as establishing, in terms of the weights and measures now in use in the United States, the equivalents of the weights and measures expressed therein in terms of the metric system, and the tables may lawfully be used for computing, determining, and expressing in customary weights and measures the weights and measures of the metric system."

The following are the tables annexed to the above:

| Metric Denominations and Values. | | Equivalents in Denominations in Use. | |
|---|---|---|---|
| Myriameter | 10,000 meters. | 6.2137 | miles. |
| Kilometer | 1,000 meters. | 0.62137 | mile, or 3,280 feet 10 inches. |
| Hectometer | 100 meters. | 328 | feet 1 inch. |
| Dekameter | 10 meters. | 393.7 | inches. |
| Meter | 1 meter. | 39.37 | inches. |
| Decimeter | 1-10 of a meter. | 3.937 | inches. |
| Centimeter | 1-100 of a meter. | 0.3937 | inch. |
| Millimeter | 1-1000 of a meter. | 0.0394 | inch. |

MEASURES OF SURFACE.

| Metric Denominations and Values. | | Equivalents in Denominations in Use. | |
|---|---|---|---|
| Hectare | 10,000 square meters. | 2.471 | acres. |
| Are | 100 square meters. | 119.6 | square yards. |
| Centare | 1 square meter. | 1,550 | square inches. |

MEASURES OF CAPACITY.

| Metric Denominations and Values. | | | Equivalents in Denominations in Use. | |
|---|---|---|---|---|
| Names. | Number of Liters. | Cubic Measure. | Dry Measure. | Liquid or Wine Measure. |
| Kiloliter or stere. | 1,000 | 1 cubic meter | 1,308 cubic yards | 264.17 gallons. |
| Hectoliter | 100 | 1-10 of a cubic meter | 2 bush. and 3.35 pecks | 26.417 gallons. |
| Dekaliter | 10 | 10 cubic decimeters | 9.08 quarts | 2.6417 gallons. |
| Liter | 1 | 1 cubic decimeter | 0.908 quart | 1.0567 quarts. |
| Deciliter | 1-10 | 1-10 of a cubic decimeter | 6.1022 cubic inches | 0.845 gill. |
| Centiliter | 1-100 | 10 cubic centimeters | 0.6102 cubic inch | 0.338 fluid oz. |
| Milliliter | 1-1000 | 1 cubic centimeter | 0.061 cubic inch | 0.27 fluid dram. |

Weights and Measures

## WEIGHTS.

| Metric Denominations and Values. | | | Equivalents in Denominations in Use. |
|---|---|---|---|
| Names. | Number of Grains. | Weight of What Quantity of Water at Maximum Density. | Avoirdupois Weight. |
| Miller or tonneau..... | 1,000,000 | 1 cubic meter..... | 2204.6 pounds. |
| Quintal ..... | 100,000 | 1 hectoliter..... | 220.46 pounds. |
| Myriagram ..... | 10,000 | 10 liters..... | 22.046 pounds. |
| Kilogram or kilo..... | 1,000 | 1 liter ..... | 2.2046 pounds. |
| Hectogram ..... | 100 | 1 deciliter..... | 3.5274 ounces. |
| Dekagram ..... | 10 | 10 cubic centimeters..... | 0.3527 ounce. |
| Gram ..... | 1 | 1 cubic centimeter..... | 15.432 grains. |
| Decigram ..... | 1-10 | 1-10 of a cubic centimeter ..... | 1.5432 grains. |
| Centigram ..... | 1-100 | 10 cubic millimeters..... | 0.1543 grain. |
| Milligram ..... | 1-1000 | 1 cubic millimeter..... | 0.0154 grain. |

## TABLES FOR THE CONVERSION OF METRIC WEIGHTS AND MEASURES INTO CUSTOMARY UNITED STATES EQUIVALENTS AND THE REVERSE.

From the legal equivalents are deduced the following tables for converting United States weights and measures:

CUSTOMARY TO METRIC. METRIC TO CUSTOMARY.

### Linear Measure.

| Meters=Ins. | Meters=Feet. | Meters=Yards. | Kilometers=Miles. | Ins.=Centimeters. | Feet=Meters. | Yards=Meters. | Miles=Kilometers. |
|---|---|---|---|---|---|---|---|
| 1= 39.37 | 1= 3.28087 | 1=1.093623 | 1=0.62137 | 1= 2.54 | 1=0.304798 | 1=0.914393 | 1= 1.60935 |
| 2= 78.74 | 2= 6.56174 | 2=2.187246 | 2=1.24274 | 2= 5.08 | 2=0.609596 | 2=1.828787 | 2= 3.21869 |
| 3=118.11 | 3= 9.84261 | 3=3.280869 | 3=1.86411 | 3= 7.62 | 3=0.914393 | 3=2.743179 | 3= 4.82804 |
| 4=157.48 | 4=13.12348 | 4=4.374492 | 4=2.48548 | 4=10.16 | 4=1.219191 | 4=3.657574 | 4= 6.43739 |
| 5=196.85 | 5=16.40435 | 5=5.468115 | 5=3.10685 | 5=12.70 | 5=1.523989 | 5=4.571966 | 5= 8.04674 |
| 6=236.22 | 6=19.68522 | 6=6.561738 | 6=3.72822 | 6=15.24 | 6=1,828787 | 6=5.486358 | 6= 9,65608 |
| 7=275.59 | 7=22.96609 | 7=7.655361 | 7=4.34959 | 7=17.78 | 7=2.133584 | 7=6.400753 | 7=11.26543 |
| 8=314.96 | 8=26.24696 | 8=8.748984 | 8=4.97096 | 8=20.32 | 8=2.438382 | 8=7.315148 | 8=12,87478 |
| 9=354.33 | 9=29.52783 | 9=9.842607 | 9=5.59233 | 9=22.86 | 9=2.743179 | 9=8.229537 | 9=14.48412 |

| Square Measure. | | | Cubic Measure. | | Square Measure. | | |
|---|---|---|---|---|---|---|---|
| Square Centimet's = Square Inches. | Square Meters = Square Feet. | Square Meters = Square Yards. | Cubic Meters = Cubic Feet. | Cubic Feet = Cubic Meters. | Square Inches = Square Centimet's | Square Feet = Square Meters | Square Yards = Square Meters |
| 1=0.155 | 1=10.764 | 1= 1.196 | 1= 35.315 | 1=0.02832 | 1= 6.452 | 1=0.09290 | 1=0.836 |
| 2=0.310 | 2=21.528 | 2= 2.392 | 2= 70.631 | 2=0.05663 | 2=12.903 | 2=0.18581 | 2=1.672 |
| 3=0.465 | 3=32.292 | 3= 3.588 | 3=105.947 | 3=0.08495 | 3=19.354 | 3=0.27871 | 3=2.508 |
| 4=0.620 | 4=43.055 | 4= 4.784 | 4=141.262 | 4=0.11326 | 4=25.806 | 4=0.37161 | 4=3.344 |
| 5=0.775 | 5=53.819 | 5= 5.980 | 5=176.578 | 5=0.14158 | 5=32.257 | 5=0.46452 | 5=4.181 |
| 6=0.930 | 6=64.583 | 6= 7.176 | 6=210.894 | 6=0.16990 | 6=38.709 | 6=0.55742 | 6=5.017 |
| 7=1.085 | 7=75.347 | 7= 8.372 | 7=247.209 | 7=0.19821 | 7=45.160 | 7=0.65032 | 7=5.853 |
| 8=1.240 | 8=86.111 | 8= 9.568 | 8=282.525 | 8=0.22653 | 8=51.612 | 8=0.74323 | 8=6.689 |
| 9=1.395 | 9=96.874 | 9=10.764 | 9=317.840 | 9=0.25484 | 9=58.063 | 9=0.83613 | 9=7.525 |

| Liquid Measure. | | | Dry Measure. | | Liquid Measure. | | |
|---|---|---|---|---|---|---|---|
| Centiliters = Fluid Ounces. | Liters = Quarts. | Liters = Gallons. | Hectoliters = Bushels. | Bushels = Hectoliters | Fluid Ounces = Centiliters. | Quarts = Liters. | Gallons = Liters. |
| 1=0.338 | 1=1.0567 | 1=0.26417 | 1= 2.8375 | 1=0.35242 | 1= 2.957 | 1=0.94636 | 1= 3.78544 |
| 2=0.676 | 2=2.1134 | 2=0.52834 | 2= 5.6750 | 2=0.70485 | 2= 5.915 | 2=1.89272 | 2= 7.57088 |
| 3=1.014 | 3=3.1700 | 3=0.79251 | 3= 8.5125 | 3=1.05727 | 3= 8.872 | 3=2.83908 | 3=11.35632 |
| 4=1.352 | 4=4.2267 | 4=1.05668 | 4=11.3500 | 4=1.40969 | 4=11.830 | 4=3.78544 | 4=15.14176 |
| 5=1.691 | 5=5.2834 | 5=1.32085 | 5=14.1875 | 5=1.76211 | 5=14.787 | 5=4.73180 | 5=18.92720 |
| 6=2.029 | 6=6.3401 | 6=1.58502 | 6=17.0250 | 6=2.11454 | 6=17.744 | 6=5.67816 | 6=22.71264 |
| 7=2.368 | 7=7.3968 | 7=1.84919 | 7=19.8625 | 7=2.46696 | 7=20.702 | 7=6.62452 | 7=26.49808 |
| 8=2.706 | 8=8.4534 | 8=2.11336 | 8=22.7000 | 8=2.81938 | 8=23.659 | 8=7.57088 | 8=30.28352 |
| 9=3.043 | 9=9.5101 | 9=2.37753 | 9=25.5375 | 9=3.17181 | 9=26.616 | 9=8.51724 | 9=34.06896 |

WEIGHT (AVOIRDUPOIS).

| Centi-grams = Grains. | Kilo-grams = Ounces Av'd'ps. | Kilo-grams = Pounds Av'd'ps. | Metric Tons = Long Tons. | Grains = Centi-grams. | Ounces. Av'd'ps. = Grains. | Pounds Av'd'ps = Kilograms. | Long Tons. = Metric Tons |
|---|---|---|---|---|---|---|---|
| 1=0.1543 | 1= 35.274 | 1= 2.20462 | 1=0.9842 | 1= 6.4799 | 1= 28.3495 | 1=0.45359 | 1=1.0161 |
| 2=0.3086 | 2= 70.548 | 2= 4.40924 | 2=1.9684 | 2=12.9598 | 2= 56.6991 | 2=0.90719 | 2=2.0321 |
| 3=0.4630 | 3=105.822 | 3= 6.61386 | 3=2.9526 | 3=19.4397 | 3= 85.0486 | 3=1.36078 | 3=3.0482 |
| 4=0.6173 | 4=141.096 | 4= 8.81849 | 4=3.9368 | 4=25.9196 | 4=113.3981 | 4=1.81437 | 4=4.0642 |
| 5=0.7716 | 5=176.370 | 5=11.02311 | 5=4.9210 | 5=32.3995 | 5=141.7476 | 5=2.26796 | 5=5.0803 |
| 6=0.9259 | 6=211.644 | 6=13.22773 | 6=5.9052 | 6=38.8793 | 6=170.0972 | 6=2.72156 | 6=6.0963 |
| 7=1.0803 | 7=246.918 | 7=15.43235 | 7=6.8894 | 7=45.3592 | 7=198.4467 | 7=3.17515 | 7=7.1124 |
| 8=1.2346 | 8=282.192 | 8=17.63697 | 8=7.8736 | 8=51.8391 | 8=226.7962 | 8=3.62874 | 8=8.1284 |
| 9=1.3889 | 9=317.466 | 9=19.84159 | 9=8.8578 | 9=58.3190 | 9=255.1457 | 9=4.08233 | 9=9.1445 |

**Weight Thermometer,** a glass cylinder to which is joined a bent capillary glass tube, open at the end. It is weighed first empty, and then when filled with mercury, the subtraction of the smaller from the larger number gives the weight of the mercury. It is then raised to a known temperature, when a certain quantity of the expanding mercury passes out. From this the temperature can be deduced.

**Wei-hei-wei** (wī-hī-wī'), a port of North China, on the Shantung promontory; about 40 miles E. of Chefoo and 115 miles S. E. of Port Arthur. The harbor, about 18 miles in circumference, is deep, and is sheltered on the N. by the small island of Liu-Kung. The port, formerly a Chinese naval station, was captured by Japan in her war with China in 1895, the land forts being taken Jan. 30 and the island Feb. 7. Admiral Ting, who had supported the forts with the Chinese fleet, offered terms of surrender that were accepted, but he committed suicide, his example being followed by Commodore Liu and the commander of the military garrison, and the Japanese took possession of the fortifications. After destroying the land defenses they withdrew leaving a garrison on the island. Their occupation was only temporary. By a convention signed at Peking, July 1, 1898, Wei-hei-wei was leased to Great Britain as an offset to the concessions granted to Russia in the Liaotung peninsula, the period of occupation to be determined by that of Russia at Port Arthur. In February, 1902, it was announced that the British government would withdraw the British troops and proceed no farther with the building of fortifications, keeping, however, nominal possession, presumably a condition of the treaty of alliance between Great Britain and Japan, for the protection of China and Korea, signed Jan. 30, 1902.

**Weil, Gustav** (vīl), a German Orientalist; born in Sulzburg, Baden, April 25, 1808. He was appointed Professor of Oriental languages in the University of Heidelberg, 1861. He wrote: "The Poetry of the Arabs" (1837); a learned "History of Mohammed the Prophet" (1843); "Historico-critical Introduction to the Koran" (1844); "Biblical Legends of the Mussulmans" (1845); "History of the Khalifs" (5 vols. 1846–1862); "History of the Islamitic People from Mohammed to the time of the Sultan Selim" (1866). He made the first German translation of the "Thousand Nights and a Night" (4 vols. 1837–1841). He died in Freiburg, Breisgau, Aug. 30, 1889.

**Weilen, Joseph von** (vī'len), a German dramatist; born in Tetin, Bohemia, Dec. 28, 1828. His works are: "Fantasies and Songs" (1853); "Men of the Sword" (1855); "Tristan" (1860); "Edda" (1865); "Drahomira" (1867); "Count Horn" (1871); and "The New Achilles" (1872). He died in Vienna, July 3, 1889.

**Weill, Alexandre** (vīl, or vāl), a French journalist; born in Schiroff, Alsace, May 10, 1811. He spent his youth in Germany as teacher, editor, and author. He wrote a series of "Alsatian Tales" that were very popular; "The Peasants' War" (1847), a historical study; "Republic and Monarchy" (1849); "Village Tales" (1853); "Mismorismes: Hymns of the Soul" (1860); "My Youth, My Adolescence, etc." (1870), an autobiography; "Parisian Romances" (1874); "Genius of Universal History" (1876); etc. He wrote much also on art, politics, and religion. He died in Paris, April 19, 1899.

**Weimar** (vī'mär), a small but interesting town of Germany; capital of the grand-duchy of Saxe-Weimar-Eisenbach, and residence of the grand-duke; 31 miles E. of Gotha and 155 S. W. of Berlin. It stands in a pleasant valley on the left bank of the Ilm; but the environs are in no way remarkable, and the town itself is irregularly and rather poorly built. Though the residence of the court, Weimar carries on neither trade nor manufactures, and seems a dull, provincial-looking town. The luster conferred on it by the residence here, at the close of the 18th and the earlier portion of the 19th century, of Goethe, Schiller, Herder, and Wieland, at the court of Karl-August, has faded since that group was

broken up by death; and now the interest of the place (Thackeray's "Pumpernickel") is almost wholly derived from its monuments, traditions, and associations. The town church (Stadtkirche), dating from the year 1400, has a "Crucifixion" by Cranach, and contains a number of memorable tombs, among which are those of Bernhard of Weimar and Herder. The ducal palace, rebuilt in 1790–1803 after the fire of 1774, is a handsome building, some of the apartments of which are decorated by frescoes illustrating the works of Goethe, Schiller, Herder, and Wieland. Other buildings are the Rothes Schloss (1574); the Grünes Schloss, with a library of 180,000 volumes, and relics of Luther and Gustavus Adolphus; the court theater (rebuilt 1825), where Liszt produced Wagner's "Lohengrin"; and the houses of Cranach, Goethe, Schiller, and Herder. The park and gardens of the palace, within which is the summer residence of Goethe, are much esteemed as a promenade. Pop. (1900) 31,117.

**Weingarten, Hermann** (vīn'gär-ten), a German church historian; born in Berlin, March 12, 1834. He was Professor of Church History at Breslau. Among his works are: "Pascal as an Apologist of Christianism" (1863); "The Revolution Churches of England" (1868); "Chronological Tables and General Views of Church History" (1870); "Rise of Monachism in the Post-Constantine Age" (1887). He died near Breslau, April 25, 1892.

**Weingartner, Felix,** an Austrian composer; born in Zara, Dalmatia, June 2, 1863. At Graz he studied under Dr. W. Mayer, and at Leipsic, in 1881, obtained a scholarship from the Austrian government. At Franz Liszt's instigation his opera, "Sakuntala," was brought out at Weimar on March 23, 1884. From 1884 to 1889 he was conductor at Königsberg, Danzig, and Hamburg, and in 1891 was appointed court conductor at Berlin. He composed several symphonic poems, a second opera ("Malawika," produced in Munich in 1886), and many songs.

**Weingunga,** or **Wainganga,** a considerable river of Central India, which flows after a S. course of 350 miles into the Wurdha, then called the Pranheta, a tributary of the Godavery. It is navigable for some distance during the rains.

**Weinhold, Karl** (vīn'hōlt), a German antiquarian; born in Reichenbach, Silesia, Oct. 26, 1823. He held the chair of German philology in various universities successively,— Breslau, Cracow, Grätz, Kiel, finally Berlin. Among his works are: "Christmas Plays and Carols of Southern Germany and Silesia" (1853); "Researches in German Dialects" (1853); "Ancient Norse Life" (1856); "The Giants of German Myth" (1858); "Heathen Burial in Germany" (1859); "German Womankind in the Middle Ages" (2 vols., 2d ed. 1882).

**Weinmannia** (named after John W. Weinmann, a Ratisbon apothecary and botanist, who about 1750 published his "Phytanthoza Iconographica"), in botany, the typical genus of *Weinmanneæ;* evergreen shrubs or trees, with reticulated petioles, compound or simple leaves, calyx four-parted, petals four, stamens eight, an hypogynous disk, fruit a many-seeded capsule, About 40 species are known, from South America, South Africa, Madagascar, New Zealand, etc. The bark is astringent; that of one species is used in Peru for tanning leather, and for adulterating Peruvian bark, and that of *W. tinctoria* is employed in Bourbon for dyeing red.

**Weir,** a dam or dyke thrown across a river or stream to raise the level of the water for the purpose of diverting it to drive machinery, irrigate land, or supply towns, or to render the upper portion of the stream navigable, or for some other purpose. A weir is constructed of stone, or, as in the United States, of timber, crossing the river at right angles or obliquely. Sometimes it takes the form of a V, the apex pointing up the river. The up-stream face is vertical or nearly so, and the down-stream face slopes gently or is cut into a series of steps which break the overflowing water into a number of diminutive cascades. Great engineering skill is required for the construction of a weir. The term is also applied to an escape pipe for carrying off surplus water from a reservoir.

**Weir, Arthur,** a Canadian poet; born in Montreal, Canada, June 17, 1864; was graduated at McGill University in 1886. He was for several years a journalist, then an analytical chemist, and afterward a banker. He wrote "Fleurs de Lys" (1887); "The Romance of Sir Richard," etc. (1890); "The Snowflake, etc." (1896); "The Commercial Development of Canada," etc.

**Weir, Harrison W.,** an English illustrator and writer; born in Lewes, Sussex, England, May 5, 1824. He was noted for his engravings of animals; was one of the original members of the Society of Painters in Water-Colors; on the original staff of the "Illustrated London News," "Field," "Pictorial Times," "Pictorial World," "Graphic," and "Black and White"; and a designer of race cups for Goodwood, Ascot, etc. He wrote: "The Poetry of Nature" (1865); "Funny Dogs with Funny Tales"; "The Adventures of a Bear"; "Bird Stories"; "Our Cats"; etc. He died Jan. 4, 1906.

**Weise, Christian** (vī'zuh), a German educationist and poet; born in Zittau,

April 30, 1642. He wrote admirable text-books for school instruction; "Curious Thoughts on German verse" (2 vols. 1691–1695); several dramas and romances; a volume of poems; "Overflowing Thoughts of Early Youth" (1668). His best works are his satirical tales, as "The Three Chief Arch-Fools"; "The Bavarian Machiavel"; "Kathrine the Shrew." He died in Zittau, in 1708.

**Weismann, August** (vīs'män), a German zoölogist; born in Frankfort-on-the-Main, Jan. 17, 1834. He became professor at Freiburg in 1871. He denied the possibility of the inheritance of acquired characters; was one of the leading minds engaged in the study of evolution. His writings provoked much discussion, and have been a great stimulation to research. Among his principal works are: "Studies in the Theory of Descent" (1880); "Essays on Heredity" (London, 1888–1892); "Germ Plasm" (London, 1893); etc.

**Weiss, Bernhard** (vīs), a German theologian; born in Königsberg, June 20, 1827; studied at Königsberg, Halle, and Berlin; became privat-docent at Königsberg in 1852, and professor extraordinary in 1857; and was called to a chair at Kiel in 1863, to Berlin in 1877, where also in 1880 he became superior consistorial councillor and adviser to the government in spiritual concerns. Of his numerous works three stand among the first in importance of their time: "Biblical Theology of the New Testament" (1868; 5th ed. 1888; Eng. trans. 2 vols. 1882–1883), a book unequalled in grasp and insight; "Introduction to the New Testament" (1887; Eng. trans. 1887–1888), the fullest and best orthodox book on the subject; and "Life of Jesus" (1882; Eng. trans. 3 vols. 1883–1884), perhaps, on the whole, the most satisfactory bulwark that has been raised to defend the faith in the cardinal fact of Christianity against its assailants. His earlier books on the Petrine theology (1855), Philippians (1859), the theology of John (1862), Mark (1872), and Matthew (1876) prepared the way for these. Weiss also prepared the newest editions of Meyer's commentaries on Matthew (1883), Mark and Luke (1878 and 1885), John (1886), Romans (1887), the Pastoral Epistles (1885), the Epistles of John (1888), and Hebrews (1888). His works on the Revelation appeared in 1891; that on the Catholic Epistles in 1892.

**Weiss, John,** an American clergyman and author; born in Boston, Mass., June 28, 1818. He published: "Æsthetic Prose" (1845), a translation of Schiller's philosophical and æsthetic essays; "Life and Correspondence of Theodore Parker" (2 vols. 1864); "American Religion" (1871); "Wit, Humor, and Shakespeare" (1880). He was a disciple of the Transcendental philosophy, an earnest abolitionist, an advocate of woman's political enfranchisement, and a defender of reason in religion. He died in Boston, March 9, 1879.

**Weisse, Christian Felix** (vī'suh), a German author; born in Annaberg, Jan. 28, 1726. He wrote: "Sportive Lays" (1758), in the Anacreontic vein; "Lays of the Amazons" (1760); and several tragedies and comedies; he was less successful with these than with his comic operas, which for a long time held the boards of the Leipsic theater. He wrote also "Songs for Children" (1776). He died in Leipsic, Dec. 16, 1804.

CHRISTIAN F. WEISSE.

**Weisse, Christian Hermann,** a German philosopher; born in Leipsic, Aug. 10, 1801; grandson of Christian F. He was Professor of Philosophy at Leipsic from 1845. He wrote: "The Idea, the Treatment, and the Sources of Mythology" (1828); "System of Æsthetics as a Science" (2 vols. 1830); "The Idea of Godhead" (1833); "Theodicy in German Rhymes" (1834); "Principles of Metaphysic" (1835); "The Gospel History Treated Critically and Philosophically" (2 vols. 1838); "Luther's Christology" (1852). He died in Leipsic, Sept. 19, 1866.

**Weissenburg** (vī'sen-börg), a town of Germany; in the province of Alsace-Lorraine; at the foot of the Vosges Mountains; on the Lauter; 34 miles N. N. E. of Strasburg. In the Franco-Prussian War of 1870–1871 a battle took place here on Aug. 4, 1870, the first important engagement between the two armies, in which the French were defeated. Pop. (1900) 6,946.

**Weissnichtwo** (vīs-ni*h*-vō) ("I know not where"), a place in Carlyle's "Sartor Resartus," generally supposed to represent London, spoken of as containing a university, in which Herr Teufelsdröch is professor.

**Weitbrecht, Gottlob Friedrich,** a German theologian; born in Culm, June 4, 1840; studied at Tübingen, and after travels in England and Scotland, and a considerable experience in teaching, settled in 1885 as pastor in Stuttgart. Of his numerous writings the most important are: "Life of Jesus" (2d ed. 1883); "Our Faith" (1888) "Morality Man's Glory" (1889).

**Weitzel, Godfrey,** an American military engineer; born in Cincinnati, O., Nov.

1, 1835; was graduated at the United States Military Academy in 1855; promoted 1st lieutenant of engineers in 1860, and assigned to the Department of the Gulf as chief engineer. He was commissioned Brigadier-General of volunteers in August, 1862, and in the following October defeated a strong Confederate force in Labadieville, La., was promoted captain of engineers, March 3, 1863, and served in Western Louisiana; and was brevetted lieutenant-colonel, U. S. A., in July, 1863, "for gallant and meritorius services at the siege of Port Hudson." He later participated in the battles of Swift's Creek and Drury's Bluff and at the siege of Fort Harrison; was promoted Major-General of volunteers in September, 1864, and during the same year built the defenses of James river, Deep Bottom, and Bermuda Hundred. In March–April, 1865, he had command of all the troops N. of the Potomac river and marched into Richmond, April 3, 1865; was brevetted Major-General, U. S. A., in March, 1865, and was promoted lieutenant-colonel of engineers in 1882. He died in Philadelphia, Pa., March 19, 1884.

**Weizsäcker, Karl Heinrich** (vīts'sāker), a German theolgian; born in Oehringen, Würtemberg, Dec. 11, 1822. He became court chaplain at Stuttgart in 1851; member of the superior consistory there, 1859; Professor of Theology at Tübingen, 1861; chancellor of the university, 1890; and privy councilor, 1894. Among his chief works are: "Researches in Evangelical History" (2d ed. 1891); "The Apostolic Age of the Christian Church" (2d ed. 1892; English translation 1894); etc. His translation into German of the New Testament (7th ed. 1894) has been greatly liked.

**Welbeck Abbey,** the seat of the Duke of Portland, in Nottinghamshire, England; 3 miles S. of Worksop. Occupying the site of an old Premonstratensian abbey, it came from "Bess of Hardwick" to her son Sir Charles Cavendish, the father of the 1st Duke of Newcastle, whose far-away heiress married in 1734 the 2d Duke of Portland. It stands in a park 10 miles in circumference, and is a stately Palladian edifice of mainly the 17th and 18th centuries, but was greatly enlarged about 1864 by the 5th duke, to whom it owes its semi-underground picture gallery, ball room, and riding school, the last 385 feet long, 104 feet wide, and 51 feet high.

**Welby, Amelia (Coppuck)** (pen name AMELIA), an American poet; born in St. Michaels, Md., Feb. 3, 1819. Her collected poems were published in Boston (1844), in New York (1850), and a final collection after her death, in 1860. She died May 3, 1852.

**Welch, Ashbel,** an American civil engineer; born in Nelson, N. Y., Dec. 4, 1809; engaged as an engineer on the Lehigh canal in 1827; was made chief engineer of the Delaware and Raritan canal in 1835, and afterward planned the route and constructed the Belvidere and Delaware railroad. In 1862 he became manager of the Pennsylvania railroad lines in New Jersey, and subsequently was made president. He introduced the block system in railroading in the United States, and published papers on economics and civil engineering. He was elected president of the American Society of Civil Engineers in 1881. He died in Lambertville, N. J., Sept. 25, 1882. See BLOCK SYSTEM.

**Welch, Philip Henry,** an American humorist; born in Angelica, N. Y., March 1, 1849. He had the distinction of being the maker of innumerable newspaper jokes, and short dialogues, the writing of which he made a profession. His books are: "The Taylor-Made Girl" (1888); and "Said in Fun" (1889). He died in Brooklyn, N. Y., Feb. 24, 1889.

**Welcker, Friedrich Gottlieb** (vel'ker), a German archæologist; born in Grünberg, Hesse, Nov. 4, 1784. He became Professor of Archæology at Giessen in 1809; Göttingen, 1816; at Bonn, 1819. Besides editing editions of a number of Greek authors, he wrote: "The Æschylean Trilogy" (1824; supplement, 1826); "Greek Tragedy Arranged with Regard to the Epical Cyclus" (3 vols. 1841), an epoch-making work; "Ancient Monuments" (5 vols. 1849–1864); "Greek Mythology" (3 vols. 1862); "The Epical Cyclus" (2d ed. 1865–1882); etc. He died in Bonn, Dec. 17, 1868.

**Welcker, Karl Theodor,** a German Liberal; born in Oberofleiden, Ober-Hessen, March 29, 1790; brother of the preceding; studied in Giessen and Heidelberg (1807–1811), and became in 1814 professor at Keil, in 1816 at Heidelberg, in 1819 at Bonn, and in 1823 at Freiburg. In 1831 he entered the Baden Chamber, where he soon became leader of the Liberals. In 1833 he was suspended, was restored in 1840, again suspended in 1841, became in 1848 representative of Baden at the German National Assembly, from which he withdrew in June, 1849, and next year entered the Baden Chamber. He died at Heidelberg, March 10, 1869.

**Weld,** the *Reseda luteola;* a branched mignonette, two or three feet high, with linear, lanceolate, undivided leaves, long spike-like racemes of flowers, three to five yellow petals, four sepals, and three stigmas. It occurs in Europe, Western Asia, and Northern Africa, and has been introduced into the United States. It yields a yellow dye. A paint is also made from it called Dutch pink. Dyers' greening weld is *Genista tinctoria.*

**Welded Tube,** a gas or water pipe made of a skelp bent to a circular form, raised to a welding heat in an appropriate furnace, and as it leaves, almost at a point of fusion, it is dragged by the chain of a draw bench through a pair of bell-mouthed jaws. These are opened at the moment of introducing the end of the skelp, which is welded without the agency of a mandrel.

**Welding,** the union produced between the surfaces of pieces of malleable metal when heated almost to fusion and hammered. When two bars of metal are properly welded the place of junction is as strong, relatively to its thickness, as any other part of the bar. Practically, iron is the only metal welded.

**Welding Heat,** the heat necessary for welding two pieces of metal; specifically, the white heat to which iron bars are brought when about to undergo this process.

**Welding Machine,** a machine for uniting the edges of plates previously bent, so as to lap within a chamber when they are exposed to a gas flame, and from which they pass to the rolls or hammer which completes the joint.

**Welhaven, Johan Sebastian Cammermeyer** (vel'hä-ven), a Norwegian poet; born in Bergen, Dec. 22, 1807. He founded a weekly newspaper, "Vidar" (1833), which was changed into the daily "Constitutionelle" (1836). He wrote "Poetic Art and Character of Henrik Wergeland" (1832), which awakened a great controversy; and "Norges Daemring" (Norway's Twilight: 1834), political sonnets stirring up great strife of thought. Collections of his unpolemical poems appeared in 1851 and in 1863. He died in Christiania, Oct. 21, 1873.

**Well,** originally a natural flowing spring; later, excavations for water, which are among the most ancient permanent human constructions. Wells several hundred feet deep are spoken of as existing in the North African desert by ancient writers. The wells of the Sahara are square holes cut in the sand, beneath which, in most places, lies a continuous sheet of water at convenient distances for digging. Wells in the East are generally round, and are either cut in solid rock or stone, without a curb and closed with a flat stone. The Greek and Roman wells were provided with a curb, long before well sweeps or pulleys were invented, as the deeply worn grooves in the curbs of ancient wells prove. Some of the most remarkable wells in the world are that at Ahmebadad, an exquisite combination of galleries, pillars, and deep pools, sunk beneath the soil; one at Cairo, ascribed to the patriarch Jacob, several hundred feet deep, down which beasts of burden travel and bring up water; and that at Serapa, Italy, nine feet in diameter, cut in the solid rock to a depth of 1,700 feet.

**Welland Canal,** a ship canal in Ontario, Canada, extending from Port Colborne, on Lake Erie, to Port Dahousie on Lake Ontario, a distance of 27 miles. It was opened to travel in 1833. The total amount expended on its construction to June 30, 1900, was $24,293,587. In the fiscal year 1898–1899 a total of 2,202 vessels passed through this canal, transporting 789,777 tons of freight.

**Welldon, James Edward Cowell,** an English educator; born in Tunbridge, England, April 25, 1854. He was head-master of Dulwich College, 1883; of Harrow School, 1885; Bishop of Calcutta and Metropolitan of India, 1898-1902; and Dean of Manchester, from 1906. Works: Translations of Aristotle's "Politics," "Rhetoric," and "Nicomachean Ethics," and "Sermons Preached to Harrow Boys"; "The Spiritual Life"; "The Hope of Immortality."

**Well Dressing,** an old custom observed at Tissington, Derbyshire, England, of dressing the wells and springs with flowers on Ascension Day. After morning prayer, a procession is formed, headed by the clergyman, and the wells are visited and prayers offered and hymns sung at each well. The custom is said to commemorate a fearful drought which visited Derbyshire in the summer of 1615, during which time the wells of Tissington flowed as usual. More probably it is a survival of water worship.

**Welle-Makua** (wel'le mä-kö'ä), a great river of Central Africa, a tributary of the Kongo; about 900 miles long. It falls into the latter river about 50 miles below Equatorville, on the N. side, and drains an exceedingly rich country to the N. and E. of the Kongo. For many years the identity of the Welle-Makua was uncertain; explorers thought that it and the Mobangi were different streams, but in 1888 their identity was fully established, and now the river is known throughout its length as the Welle-Makua.

**Welles, Gideon,** an American statesman; born in Glastonbury, Conn., July 1, 1802; studied law; and in 1826 became proprietor of the Hartford "Times." In 1861 he was appointed by President Lincoln Secretary of the Navy, and filled that office with marked success and credit during the whole of the Civil War. After his retirement he published his "Memoirs of the War." He died in Hartford, Conn., Feb. 11, 1878.

**Wellesley** (welz'li), **Richard Colley, Viscount and Marquis,** and Earl of Mornington, eldest son of Garrett, 1st earl of Mornington, and eldest brother of the Duke of Wellington; a British statesman; born in Dublin, Ireland, June 20, 1760. He was

educated at Eton and Oxford. On his majority he took his seat as Earl of Mornington in the Irish House of Peers, and three years after was returned to the British House of Commons as member for Beeralston. Thus, by a curious anomaly, he was at once a peer and a commoner. He distinguished himself in 1789 in the debates on the regency question. In this discussion, his defense of the royal prerogative, made known to George III. after his recovery, pleased him so much that the earl at the next general election was returned for Windsor, and made a member both of the Irish and the English privy-council. These were only preliminaries to the higher appointment of Governor-General of India, which was conferred on him in 1797, along with a British peerage under the title of Baron Wellesley. His administration forms an era in the history of the British Indian empire. He returned to England in 1805, and in 1809 became foreign secretary under Mr. Perceval. In 1812 he resigned his place, chiefly because he was in favor of Catholic emancipation. He did not return to office till 1822, when he became Lord-Lieutenant of Ireland. This post he retained till 1827. In the Grey ministry he again (1833) became Lord-Lieutenant of Ireland, but finally retired from public life in 1835. He died in London, Sept. 26, 1842.

**Wellesley College,** an American educational institution established in 1870 in the village of Wellesley, Mass., 15 miles S. W. of Boston. The institution is devoted entirely to the higher education of women. Besides the main building, which is 475 feet long and five stories high, there are the Farnsworth School of Art, the School of Music, the Chemistry Building, Stone Hall and eight cottage dormitories. The campus contains about 300 acres; which prior to the college establishment comprised a private and highly cultivated country-seat. The institution is non-sectarian, and was founded by Henry F. Durant, of Boston. The college has an endowment exceeding $1,080,000; grounds and buildings valued at over $1,275,000; scientific apparatus, etc., $100,000; volumes in the library, about 65,000; average number of faculty, 105; average student attendance, 1,300; graduates, over 3,600.

**Wellesley Islands,** a group in the Gulf of Carpentaria, Australia, belonging to Queensland. Mornington Island, the most N. and largest, is 40 miles in length by 15 in breadth.

**Wellhausen, Julius,** a German scholar; born in Hameln, Germany, May 17, 1844; studied at Göttingen under Ewald; became privat docent there in 1870; and Ordinary Professor of Theology at Greifswald in 1872. He resigned in 1882 from conscientious reasons, first became Professor Extraordinary in Philology at Halle, in 1885 Ordinary Professor of Oriental Languages at Marburg, and in 1892 in Göttingen. He made his name widely known by his equally able and uncompromising application of the views of Graf and Kuenen to the fundamental problems of Old Testament history. His books are "The Text of the Book of Samuel" (1872); "Pharisees and Sadducees" (1874); "History of Israel" (vol. i, 1878, rewritten as "Prologue of the History of Israel"); "Plans and Preparations" (4 parts 1884–1889); "Mohammed in Medina" (1882); and "The Composition of the Hexateuch" (1889). He also edited the fourth and fifth editions of Bleek's "Enlightenment in the Old Testament."

**Welling, James Clarke,** an American educator; born in Trenton, N. J., July 14, 1825; was graduated at Princeton College in 1844; engaged in journalism in 1856–1865, being literary editor of the "National Intelligencer" in Washington. Prior to and during the Civil War he was a strong opponent of secession. He favored the proposition of President Lincoln to free the slaves with compensation to loyal owners, but doubted the constitutionality of the Emancipation Proclamation. He was president of St. John's College, Annapolis, Md., in 1867–1870, and Professor of Belles-Letters at Princeton College in 1870–1871. In the latter year he was chosen president of Columbian University, Washington, D. C. He was actively interested in the work of the Corcoran Art Gallery and the Smithsonian Institution; was also identified with the Anthropological and Philosophical Societies of Washington. He died in Hartford, Conn., Sept. 4, 1894.

**Wellingborough,** a market town of Northamptonshire, England, on a declivity near the confluence of the Ise with the Nen, 10½ miles E. N. E. of Northampton. Almost destroyed by fire in 1738, it has a chalybeate spring (the "Red Well"), said to have been resorted to by Charles I. and Henrietta Maria; a large and imposing parish church (restored 1861–1874), mainly Decorated and Perpendicular in style; a corn exchange (1861); a grammar school (1595), transferred to new buildings in 1880; and important industries of boot making, iron smelting, etc. Pop. (1901) 18,412.

**Wellington,** a city and capital of New Zealand; on Port Nicholson, an islet of Cook's Strait; on the S. W. extremity of the provincial district of Wellington, North Island. Its harbor is 6 miles long and 5 wide. It has two wharves and a patent slip. The principal buildings are the Government House, the Houses of Legislature, the Government Buildings (an enormous

wooden building), the Supreme Court, the post and telegraph offices, the cathedral and other churches, the Colonial Museum, theaters, Wellington College, a Roman Catholic college, etc. It has several daily and weekly newspapers, botanic gardens, tramways, etc., and is lighted by electricity. Pop. (1906), with suburbs, 63,807. The provincial district of Wellington has an area of 11,003 square miles; pop. (1906) 179,868. It has an equable and healthy climate, but is subject to earthquake shocks. It is intersected by several mountain ranges, but there are many fine agricultural and pastoral districts. Gold was found in 1881. The chief rivers are the Manawatu and Wanganui, both navigable.

**Wellington,** an island of South America, off the W. coast of Patagonia. It is 138 miles long and 35 in width. Its N. extremity is Cape San Roman.

**Wellington, Arthur Wellesley, Duke of,** a British general and statesman; born in Dublin, Ireland, April 30, 1769; the third

DUKE OF WELLINGTON.

son of the 1st Earl of Mornington; was educated at Eton, at Brighton, and finally at the Military College of Angers. In 1787 he received a commission as ensign in the 73d Foot, and after a rapid series of changes and promotions, attained by purchase in 1793 the command as lieutenant-colonel of the 33d Regiment. During 1794 and 1795 he served with his regiment under the Duke of York in Flanders. In 1796 his regiment was dispatched to Bengal, Colonel Wellesley landing at Calcutta in February, 1797, at a critical moment for the British power in India. War had just been declared against Tippoo Sahib, and an army of 80,000 of which Colonel Wellesley's regiment formed part, marched against him. An engagement took place at Mallavelly (Mysore) on the 27th, in which Wellesley, who commanded the left wing, turned the right of the enemy. He was subsequently employed to dislodge the enemy from their posts in front of Seringapatam, and after the capture of that capital he was appointed, in 1799, to the administration of Mysore, his brother being at this time governor-general (see WELLESLEY).

In 1802 he attained the rank of Major-General, and in the following year he was appointed to the command of a force destined to restore the Peishwa of the Mahrattas, driven from his capital by Holkar. After this operation had been successfully performed the other Mahratta chiefs, Scindia and the Rajah of Berar, showed hostile designs against the British, and Wellesley was appointed to the chief military and political command in the operations against them. After an active campaign, in which he took Ahmednuggur and Arungabad, he encountered a powerful Mahratta army, assisted by French officers, at Assaye, Sept. 23, and entirely defeated it. The parallel successes of General Lake, and the defeat of the Rajah of Berar by Wellesley at Argaum, Nov. 29, compelled the submission of the Mahrattas, and peace was restored on conditions drawn up by the successful general.

Early in 1805, his health failing, Wellesley obtained leave to return home, and arrived in England in September. He had before leaving Madras received his appointment as Knight Commander of the Bath. From November to February he was engaged as Brigadier-General in Lord Cathcart's expedition to the Continent, which was without result. In January, 1806, he succeeded Lord Cornwallis as colonel of his own regiment, the 33d. On April 10, 1806, he married Lady Catherine Pakenham, third daughter of the Earl of Longford. He was shortly afterward elected M. P. for Rye, and in April, 1807, was appointed secretary of state for Ireland. In August, he received the command of a division in the expedition to Copenhagen under Lord Cathcart and Admiral Gambier, and took Kioge on April 29, the only land operation of importance. On April 28, 1808, he attained the rank of Lieutenant-General, and in June received the command of a force destined to operate in the N. of Spain and Portugal. He was subsequently superseded; but before giving up the command he gained the battle of Vimeira over Junot, the campaign being brought to a close with the convention of Cintra, by which the French agreed to evacuate Portugal.

In 1809 Wellesley was appointed to take the chief command in the Peninsula, which had been overrun by the French. The famous passage of the Douro, and the defeat of Soult which followed, fittingly opened this masterly campaign. For the victory at Talavera (July 28), the first of a long list that subsequently took place in the Penin-

sula, the government raised the Commander-in-Chief to the peerage as Viscount Wellington. Toward the end of 1810 Wellington fought the battle of Busaco, which was followed by the famous fortification and defense of the lines of Torres Vedras. A little later (in 1811) occurred the victory of Fuentes de Onoro. In the following year he took Ciudad Rodrigo and Badajoz by storm, and fought the battle of Salamanca, accounted one of his most famous victories. On August 12, 1812, Wellington entered Madrid. For his brilliant conduct of the campaign thus far he received the thanks of Parliament, was raised to the dignity of marquis, and a sum of $500,000 was voted to purchase him an estate. Next followed the battle of Vittoria (June 21, 1813), for which decisive victory Wellington was given the baton of Field-Marshal; then battles in the Pyrenees, the capture of San Sebastian and the crossing of the Bidassoa into France. In 1814 the battle of Orthez was gained, and in the same year the battle of Toulouse, in which Soult's best troops were routed, and the hopes of France in the Peninsula utterly annihilated. The way was now open for the British troops to the heart of France. In six weeks, with scarcely 100,000 men, Wellington had marched 600 miles, gained two decisive battles, invested two fortresses, and driven 120,000 veteran troops from Spain.

Napoleon abdicated on April 12, and a few days later the war was brought to a close by the signing of conventions with Soult and Berthier. In May the triumphant general was created Marquis of Douro and Duke of Wellington, with an annuity of $50,000, commuted afterward for $2,000,000. He received the thanks of both Houses of Parliament. In July he went as ambassador to France, and succeeded Lord Castlereagh as British representative in the Congress of Vienna. In April he took command of the army assembled in the Netherlands to oppose Napoleon (see FRANCE: NAPOLEON I.: WATERLOO, BATTLE OF). On his return to England after the restoration of peace he received a vote of $1,000,000 for the purchase of the estate of Strathfieldsaye, to be held on presenting a colored flag at Windsor on the 18th of June each year.

With the return of peace he resumed the career of politics. He accepted the post of master-general of the ordnance with a seat in the cabinet of Lord Liverpool in January, 1819. In 1822 he represented Great Britain in the Congress of Vienna. In 1826 he was appointed high-constable of the Tower. On Jan. 22, 1827, he succeeded the Duke of York as Commander-in-Chief of the forces. On Jan. 8, 1828, he accepted the premiership, resigning the command of the forces to Lord Hill. In January, 1829, he was appointed governor of Dover Castle, and lord warden of the Cinque Ports. In 1830 repeated motions for parliamentary reform were defeated, but the growing discontent throughout the country on this subject and a defeat in Parliament caused the resignation of the government in November. His opposition to reform made the duke so unpopular that he was assaulted by the mob June 18, 1832, and his life endangered. He accepted office under Sir Robert Peel in 1834–1841, and again in 1846, when he helped to carry the repeal of the corn laws, which till then he had opposed. In 1842 he resumed the command of the forces on the death of Lord Hill. He died in Walmer Castle Sept. 14, 1852.

**Wellington, Fort,** a defensive work in Ontario, Canada, near Prescott.

**Wellington College,** an educational institution in Berkshire, England, 4 miles S. S. E. of Wokingham; founded in 1853, in memory of the Duke of Wellington, from funds raised by public subscription. The foundation stone was laid by Queen Victoria in 1856, and it was opened by her in 1859. It has 90 scholarships for the sons of deceased army officers, 12 exhibitions, 7 open scholarships, and over 400 pupils.

**Wellingtonia,** a representative of one of the giants in vegetable life, and a name given by Professor Lindley to a conifer, native of California, but afterward it was known to botanists that the tree ranged under the genus *Sequoia,* another species of the genus having been described some years earlier under the name of *S. sempervirens.* The cognomen of Wellingtonia is "big tree of California." See BIG TREES.

**Wellman, Walter,** an American journalist, explorer, and aeronaut; born in Mentor, O., Nov. 3, 1858; led exploring and scientific expeditions to Watling island, Spitzbergen, and Franz Josef Land; made several unsuccessful attempts to reach the North Pole by airship; and in October, 1910, undertook to cross the Atlantic in his dirigible balloon "America," but was compelled by a storm to abandon it off Cape Hatteras, after being in the air nearly 72 hours and covering about 850 miles.

**Wells,** a city in Somerset, England; at the foot of the Mendip Hills; 20 miles S. W. of Bath and 20 miles S. of Bristol. Here, near St. Andrew's Well, from which and other springs the place took its name, King Ina in 704 established a house of secular canons; but the see was first founded in 909 by Edward the Elder, and the city has grown up round the cathedral. The see was translated to Bath during the first half of the 12th century, and still is styled Bath and Wells, though Bath's connection has been purely titular since the Reformation. Among its 70 bishops have been Jocelin (1206–1242), the "second founder" of the cathedral, Fox, Wolsey, Barlow, Laud, and Ken. That cathedral, though one of the

smallest yet perhaps the most beautiful of English cathedrals, is mainly Early English in style, and is 371 feet long, by 123 across the transept, while the height of the central tower is 160 feet, of the two W. towers 130. Its principal glory is the W. front, with its matchless sculptures (600 figures in all, of which 151 are life-size or colossal); but other features are the N. porch, the inverted tower arches, the E. Jesse window with its splendid old glass, the exquisite lady chapel, and the octagonal chapter house with its windows and central column in the perfect style of 1300. Other buildings, all of extreme interest, are the moated episcopal palace, with an undercrypt of about 1220; the deanery, rebuilt by Dean Gunthorpe in the reign of Edward IV.; the archdeaconry, now remodelled as a theological college; the gateways and St. Cuthbert's Church, with a noble W. tower. It was chartered by King John in 1202.

**Wells, Charles Jeremiah,** an English poet; born in London in 1800; was educated at Edmonton with Keats's brother, and Horne the author of "Orion."" With Keats himself he grew intimate, and after that intimacy was snapped by a hoax on the poet's brother, it was in rivalry with Keats that he wrote the little prose volume, simple, idyllic, stillborn — "Stories After Nature" (1822). Two years later appeared "Joseph and His Brethren, by 'H. L. Howard'"; the dramatic poem on which Hazlitt remarked: "By the by, I have read your poem. It shows great genius; and — I advise you to stick to your profession." Law was the profession, Wells being then under articles to a solicitor; but though he hardly stuck to law, he so far followed the advice that he published no more, beyond a "Sonnet to Chaucer," one "Story after Nature" more, and two papers on "Boar-hunting in Brittany." "Joseph" lay long neglected, by no man more than by its author, who from fishing and boating in South Wales betook himself about 1840 to Brittany, and finally settled at Marseille, where he died Feb. 17, 1879. But "Joseph" ere that had been brought from prison by Swinburne, whose attention was called to it by Dr. G. Rossetti, and who, after vainly dwelling, in his "Essay on Blake" on the "dramatic language, passion, and characterization of this great poem," had the tardy satisfaction of adding to the reprint (1876) an "Introduction" that commanded from the critics an almost unanimous credit of "the most Shakespearean drama since Shakespeare's day."

**Wells, Clark Henry,** an American naval officer; born in Reading, Pa., Sept. 22, 1822; was graduated at the United States Naval Academy in 1846; served through the Mexican War, and accompanied the Atlantic cable expedition in 1857; served through the entire Civil War and later with the squadron off Brazil, and on the coast of Italy. For rendering assistance to a French ironclad in distress he received the cross of the Legion of Honor. He was promoted rear-admiral April 1, 1884. He died in Washington, D. C., Jan. 28, 1888.

**Wells, David Ames,** an American political economist; born in Springfield, Mass., June 17, 1828; was graduated at Williams College in 1847, and at the Lawrence Scientific School in 1851; and became assistant professor in the latter institution. In 1866 he was made the chairman of a commission to devise the best means to raise money for the government; in 1866–1870 was a special commissioner of revenue; and in 1879 was appointed a member of the Board of Arbitration for Railroads. His publications include: "Our Burden and Our Strength" (1864); "The Creed of the Free Trader" (1875); "Why We Trade and How We Trade" (1878); "The Silver Question, or the Dollar of the Fathers *vs.* the Dollar of the Sons" (1878); "Our Merchant Marine; How it Rose, Increased, became Great, Declined, and Decayed" (1882); "Relation of Tariff to Wages" (1888); etc. He died in Norwich, Conn., Nov. 5, 1898.

**Wells, Horace,** an American dentist; born in Hartford, Vt., Jan. 21, 1815; was educated in academies; studied dentistry and practised in his native city. He long sought a remedy for preventing pain in extracting teeth. After making a number of unsuccessful experiments he became convinced that nitrous oxide offered the only effective method. On Dec. 11, 1844, he put his conviction to a practical test by having one of his own teeth extracted while under its influence, which was done without pain. He then adopted this gas in his private practice. He published "A History of the Application of Nitrous Oxide Gas, Ether, and other Vapors to Surgical Operations." He died in New York city, Jan. 24, 1848. His claims to have discovered anæsthesia were controverted by Drs. Gardiner I. Colton, William T. G. Horton, John C. Warren, and Charles T. Jackson, each of whom asserted the honor to be his. A bronze statue of Dr. Wells, with an inscription ascribing the priority of the discovery to him, stands in Bushnell Park, Hartford, Conn.

**Wells, H. G.,** an English novelist; born in Bromley, Kent, England, Sept. 21, 1866; was educated at the Royal College of Science, London. Starting as a teacher in London, he became a journalist there. He wrote: "The Time Machine," (1895); "Select Conversations with an Uncle" (1895); "The Wonderful Visit" (1895); a humorous satire; "The Island of Dr. Moreau" (1896); "The Wheels of Chance" (1896); "Thirty Strange Stories" (1897);

"The Invisible Man" (1897); "The War of the Worlds" (1898); "Tales of Space and Time" (1899); "Love and Mr. Lewisham" (1900); etc.

**Wells, Catherine Boott,** known as MRS. KATE GANNETT WELLS, an American essayist and novelist; born in England in 1838; was the daughter of Ezra Stiles Gannett (1801–1871), a well-known Unitarian clergyman of Boston, Mass. Her works were collected in volumes: "In the Clearings"; "Miss Curtis"; "Two Modern Women"; "About People"; etc.; also some Sunday-school manuals.

**Welsbach Light,** an invention of Carl Auer von Welsbach, an Austrian, in 1884. In Europe it is known as the Auer light. It is based upon the discovery that certain materials become incandescent at a low temperature. The process followed is to saturate a combustible filament in the form of a network with a solution of a salt of a refractory earth, such as zirconium. It is then dried out and burned, the combustible element disappearing and leaving a frame of refractory material, which becomes incandescent at a low temperature. The filament is called a mantle and is exceedingly fragile.

**Welsh, Herbert,** an American philanthropist; born in Philadelphia, Pa., Dec. 4, 1851; was graduated at the University of Pennsylvania (1871); studied art in Philadelphia, and (1893–1894) in the atelier of Bonnat, Paris; practised art in Philadelphia for several years; became editor of "City and State," a weekly devoted to good government, in 1895. He was one of the founders of the Indian Rights Association. Among his writings are "Civilization among the Sioux Indians"; "Four Weeks among Some of the Sioux Tribes of Dakota"; and "Report of a Visit to the Navajo, Pueblo and Hualapai Indians of New Mexico and Arizona."

**Welsh, John,** an American diplomatist; born in Philadelphia, Pa., Nov. 9, 1805; received a collegiate education; became a sugar importer and was active in public affairs in many capacities, having large railroad and financial interests. He was a member of the Sinking Fund Commission, president of the Philadelphia Board of Trade, etc., and took an active part in the relief measures during the Civil War, especially in connection with a committee that raised $1,000,000 for the Sanitary Commission. In 1813 he became president of the Board of Finance of the Centennial Exposition, receiving from the citizens of Philadelphia, at its close, a gold medal, and the sum of $50,000, with which he endowed the John Welsh chair of English literature in the University of Pennsylvania. In 1878 he became minister to England, but resigned after two years. He died in Philadelphia, April 10, 1886.

**Welsh Calvinistic Methodists,** a name for the Calvantistic Methodists, the great majority of whose congregations are in Wales, and consist in large measure of members speaking the Welsh tongue.

**Welsh Mortgage,** a mortgage in which there is no proviso or condition for repayment at any time. The agreement is that the mortgagee to whom the estate is conveyed shall receive the rents till his debt is paid, and in such case the mortgagor is entitled to redeem at any time.

**Welwitschia,** a genus of *Gnetaceæ*, with but one known species, *W. mirabilis*. It rises from the sand in which it grows, putting forth two cotyledonary leaves, which ultimately become about six feet long, or rather more, coriaceous and ragged. No other leaves follow, but the connecting stem increases horizontally both above and below the insertion of the leaves, which it clasps in a marginal slit or cavity. From the upper side of the stem at the base of the leaves there are annually developed several dichotomous stems six inches to a foot high, articulated, and with two small opposite scales at each joint, the several branches terminated by oblong cones. These contain two kinds of flowers, one hermaphrodite and the other female, with naked ovules. To a certain extent the plant connects gymnosperms with angiosperms. It grows in sandy deserts in Africa between 14–23° S., and attains a great age; some specimens being estimated as at least 100 years old.

**Welwitsch's Bat,** the *Vespertilio*, a bat of variegated colors — brown, orange, yellow, and black — described by Gray from a specimen sent from Angola by Dr. Welwitsch.

**Wemyss, Francis Courtney** (weems), an Anglo-American actor and writer; born in London, England, May 13, 1797. He acted in London in 1821, at Philadelphia, 1822; was manager of theaters in several American cities, and secretary of the Dramatic Fund Association from 1852. Among his works are: "Twenty-Six Years as Actor and Manager" (1847); "Chronology of the American Stage" (1852); and "Theatrical Biography." He edited "The Minor Drama" (7 vols. 1848–1852). He died in New York, Jan. 5, 1859.

**Wemyss, Francis Wemyss Charteris Douglas, Earl of,** an English politician; born Aug. 4, 1818; was educated at Eton and Oxford. He sat in Parliament for a division of Gloucestershire in 1841–1846, followed Sir Robert Peel on the repeal of the Corn Laws, and sat for Haddingtonshire as a Liberal Conservative from 1847 till in 1883 he succeeded his father as 9th earl. As Lord Elcho he was a Lord of the Treas-

ury in the Aberdeen ministry from 1852 till 1855. He took a very prominent part in the volunteer movement, frequently presided over the rifle meetings at Wimbledon, and wrote "Letters on Military Organization" (1871); "The New War Office" (1899).

**Wen,** an encysted tumor varying exceedingly in size and character, and commonly situated immediately under the skin; but occurring also in some of the internal viscera. The causes of their formation are unknown, but a strongly marked tendency to such swellings exists in particular individuals, leading to the belief in constitutional causes. At its commencement it is always exceedingly small and perfectly indolent, and it is often many years before it attains any considerable size. It is comprised in a membrane called a cyst, and its contents sometimes resemble fat or suet, at other times it contains serum, or a thin fetid brown or black fluid. Sometimes the cysts become very bad from the deposition of cartilaginous or even osseous matter. Frequently the cyst, especially when small, may be punctured, and its contents pressed out; but sometimes this gives rise to very severe inflammatory action. The other and safe mode of treatment is to dissect them out with the knife wherever their position will admit of it, care being taken to remove the whole of the cyst.

**Wenceslaus,** or **Wenzel,** an Emperor of Germany and King of Bohemia; born in 1361; was the son of Charles IV., whom he succeeded in 1378. He was a dissolute and cruel prince. He favored the Hussites, but was unable to save the life of Huss. He died in 1409.

**Wendell, Barrett,** an American author and educator; born in Boston, Mass., Aug. 23, 1855; was graduated in 1877 at Harvard, where he afterward taught as an instructor, an assistant professor, and (from 1898) as full Professor of English. He published: "English Composition" (1891); "Cotton Mather" (1891), in "Makers of America" series; "Raleigh in Guiana" (1897), a play; "Literary History of America" (1900); and the novels "The Duchess Emilia" (1885); and "Rankell's Remains" (1886). His "Stelligeri, and Other Essays concerning America" (1893), and "William Shakespeare: A Study" (1894), are widely known. He was American editor of "Literature."

**Wends,** the name of a section of the Slavonic race, now dwelling mostly in that part of Germany known as Lusatia, partly in Prussia, partly in the kingdom of Saxony. In the 6th century the Wends were a powerful people, extending along the Baltic form the Elbe to the Vistula, and S. to the frontiers of Bohemia. They comprised a variety of tribes. The favorite occupation of the Wends was, and still is, agriculture. There are several dialects of the Wend language still extant.

To the Wends of today, Prussia is merely a military expression: like the Jews, like the wandering tribes with no fatherland of their own, they have always remained closely united among themselves, preserving the old customs and considering the mingling of races by marriage as opposed to the laws of origin. The women wear the short skirts of vivid red and blue, not descending lower than the middle of the leg, an apron of different but equally bright color, a silken bodice crossed by a brilliantly embroidered kerchief. The headdress is peculiar; it forms a triangle on the summit of the head and two wide wings at the back; though disproportionately large, combined with the whole costume, the effect is picturesque, and it is worn with a spice of coquetry inherent to all women in any stage of civilization. The women spin and weave in the long winter evenings all the materials they use; they put on shoes and clothing only on Sundays, to go to church. Then is the time when they compare the bravery of the attire, and vie with each other in attracting the admiration of the men at the close of the sermon, delivered in the Wend tongue. The men have not remained quite so faithful to the old traditional dress, but they are all closely shaven, neither beard nor moustache being tolerated by the Wend race.

The distinctions of caste among them are very marked and scrupulously respected, although hardly noticeable to an outsider. The peasant owner of land ranks first, then the peasant whose property is smaller, the "hausler" who possesses only his cottage and, finally, the "tagelohner," whose services are hired. Marriages between the daughter of the first of these magnates and a day laborer would be considered by the forest dwellers as grave a mesalliance as the union between a princess and a private soldier. It would yet be a less degradation than mating with a Prussian.

They marry more for interest and solid advantages than for love, and it is the girl who chooses and proposes to the man. When she has selected a youth, which is generally at a very early age, she sends her mother or some experienced relative to make the necessary prudential inquiries about him; if they are satisfactory she follows with a formal demand for his hand; the ambassadress eloquently describes the qualities, wealth, and social rank of the bride, and, as soon as she has obtained the bridegroom's consent, the ecclesiastical authorities are advised and an early date fixed.

On the appointed day the bride, crowned with myrtle and clad entirely in black —

the nuptial color — is accompanied by her friends to the house of the young man, sometimes at a great distance from her own. She thanks him for taking her, and reminds him of her domestic duties; then her supporters and his drink each a mouthful of beer, and the double cortege sets out for the church, the boats that carry them being festively decorated. The bridegroom wears a wreath of foliage fastened to his hair by large wafers; the bride's mother carries a pair of fattened fowls as an offering to the minister. On the way the groom must recite the Ten Commandments and only once address his future wife, using then the words, "Chaste and good, such is life in speech and deeds," to which she answers, "A wife must love and respect her husband." The religious ceremony is long and complicated, many of the forms taking place outside the church. The concluding festivities are held at the bride's home. They last three days.

Their excessive dread of death is probably the cause of their exaggerated funeral rites. As soon as one of them dies every attention is paid to the performance of certain formalities supposed to prevent the occurrence of any signs of ill omen portending another death. All the doors and windows are thrown open to allow the soul free egress; as many candles are lit around the corpse as the deceased numbered years; the bench on which the bier was placed is burned as soon as the coffin is removed, lest any one should sit on it and court danger. All the animals belonging to the house are collected before the door, and the death of their master is announced to them with every detail of his illness and sufferings. The friends and relations are invited to assist at the funeral; they come to the house dressed in white, the color of woe; they are wrapped in large sheets, leaving only two hands and eyes visible, and the nicest discernment is observed in placing them according to their social standing. At the grave the minister is particularly careful to call out the names of all the bystanders, as an evidence that they are still in the land of the living, and many other precautionary measures are observed in private to exorcise the dread specter of death.

The nominal religion of the Wends is Protestantism, but whatever they are called on the census, they have not materially modified their beliefs and swerved from their traditions; they present the anomaly of being the last descendants of barbarians, perpetuating in the heart of Western Europe the living memory of an almost forgotten invasion, true to their origin and special characteristics, protected by their forests, their inundations, their rigorous winters, and the peculiar conformation of their strange country from the inroads of the levelling civilization at their very doors.

**Wendt, Hans Hinrich** (vendt), a German theologian; born in Hamburg, June 18, 1853; studied at Leipsic, Göttingen, and Tübingen; became privat docent in theology at Göttingen (1877), and professor extraordinary (1881), and was called to a chair at Kiel in 1883, at Heidelberg in 1885. His books include "The Ideas Flesh and Spirit in Biblical Usage" (1878); "The Christian Doctrine of Human Perfection" (1882); and "Jesus' Doctrine" (2 vols. 1886–1890; Eng. trans., 1892 — a book of unique importance), as well as the 5th to 7th editions of Meyer's "Commentary on the Acts" (1880–1889).

**Wener** (vā'ner), the largest lake of Sweden, and after those of Ladoga and Onega the largest in Europe; situated in the S. W. of the kingdom. It is 147 feet above sea-level, and of very irrégular shape. Its greatest length, N. E. to S. W., is about 100 miles; and its breadth may average about 30 miles; area, 2,306 square miles. Its chief feeder is the Klar. By a canal it communicates with Lake Wetter, but its only proper outlet is at its S. W. extremity, where its superfluous waters are received by the river Gotha. In winter it is frozen for several months, and crossed by sledges. It abounds with fish.

**Wenley, Robert Mark,** a Scotch-American educator; born in Edinburgh, Scotland, in July, 1861; was graduated at the University of Glasgow in 1884, and later pursued post-graduate study on the continent; was assistant Professor of Logic at the university of Glasgow in 1886–1894 and head Professor of the Philosophical Department in 1888–1895. He was made head of the Philosophical Department at the University of Michigan in 1896. His publications include: "Socrates and Christ" (1889); "Aspects of Pessimism" (1894); "University Extension Movement in Scotland" (1895); "Contemporary Theology and Theism" (1897); "Preparation for Christianity in the Ancient World" (1898); etc.

**Wenlock Formation, or Group,** in geology, a formation of Upper Silurian age, immediately succeeding the Llandovery formation, and having above it the Ludlow formation. If the Llandovery beds, which are of a transition character, be made to constitute the base of the Upper Silurian, then the Wenlock formation is its center. It is well developed in the vicinity of Wenlock, and is considered to be above 4,000 feet in thickness. It is of a concretionary nature, some of the concretions, locally termed ballstones, being 80 feet in diameter. The whole Wenlock fauna consists of 171 genera and 530 species. Of these there are 76 species of actinozoa, 68 of echinodermata, 78 of crustacea, 101 of brachiopoda, 44 of lamellibranchiata, and 169 of other

classes. The Wenlock formation is represented at Niagara, etc.

**Wensleydale Peerage.** In 1856 Sir James Parke (1782–1868), a judge of the Court of Exchequer, was created a life peer, in accordance with an ancient but, it was maintained wholly obsolete usage. The resolution of the House of Lords, led by Lord Lyndhurst, not to receive the new baron, led to his being given a peerage of the usual kind (it died with him). There are, however, a number of official life peers — the Lords of Appeal in Ordinary.

**Wentletrap,** in zoölogy, a popular name for the genus *Scalaria.* Those in which the whorls are close are called by collectors false wentletraps; those in which they are contiguous are known as true wentletraps. Of the former, some are found in Northern seas, and the latter are all natives of warm seas. One, the precious wentletrap (*S. Pretiosa*), from the S. E. of Asia, was formerly in such esteem that a very fine specimen is said to have sold for $1,022, though good shells may now be bought for a dollar. It is about two inches long, snow white or pale flesh-colored, with eight separated whorls; sometimes called staircase shell.

**Wentworth, John,** an American journalist; commonly known as "Long John" Wentworth; born in Sandwich, N. H., March 5, 1815; was graduated at Dartmouth College in 1836; settled in Chicago; become editor of the "Democrat," with which paper he was connected for 25 years. He was admitted to the bar in 1841; in 1843 he was elected congressman and served six terms. He introduced the first steam fire engine ("Long John") into Chicago, was influential in procuring the city charter and in establishing its public school system, and was twice elected mayor (1857 and 1860), his administrations being vigorous and notable. During his life he gave $10,000 to Dartmouth College. He died in Chicago, Oct. 16, 1888.

**Werewolf,** or **Man-wolf,** the same as the French *loup-garou,* an imaginary being believed in during the Middle Ages. According to an old writer, "The werewolves are certain sorcerers, who having anointed their bodies with on ointment which they make by the instinct of the devil, and putting on a certain enchanted girdle, do not only unto the view of others seem as wolves, but to their own thinking have both the shape and nature of wolves, so long as they wear the said girdle; and they do dispose of themselves as very wolves, in worrying and killing, and most of human creatures." This superstition was widely spread in ancient and mediæval times, and is still prevalent among many savage races, and even in corners of France, as well as Russia and Bulgaria. It is a commonplace of folklore that certain men by natural gift, or magic art, can turn for a time into ravening beasts, which Dr. Tylor calls "substantially a temporary metempsychosis or metamorphosis." And Thomas Aquinas says: "All angels, good and bad, have by natural virtue the power of transmuting our bodies." In various forms of mental disease there is a belief in a similar transformation. These insane delusions have been widely prevalent at various times in the history of human society, and have given rise to the name of lycanthropy. The wolf is not the only animal connected with such superstitions. In England he has long been unknown, and the cat has had to be largely employed in witch transformations.

Herodotus tells us the Neuri turned to wolves for a few days every year. In Vergil's 8th Eclogue we read how Mœris makes himself a wolf by means of poisonous herbs, and how he witches away the crops and calls up dead folk from their graves. Petronius Arbiter has a story of the transformation of a versipellis or turnskin, (with a circumstance familiar in European stories of werewolves and witches) and how when the wolf is wounded the man who wore his shape is found to bear exactly the same wound. The Khonds of Orissa think some men have the art of "mleepa," and by the help of a god become "mleepa tigers" to kill their enemies, one of the man's four souls going out to animate the beast. The tribe of Budas in Abyssinia have also the evil eye and the power of turning into hyenas, whence they are denied the Christian sacrament. We find werewolf warriors of peculiar ferocity in Scandinavian sagas, and to this day in Denmark a man who is a werewolf is recognized by his eyebrows meeting as if his soul were ready to take flight like a butterfly. "Wolf girdles" with the magic power of transformation are still spoken of at least in Germany; and in December one must not talk of the wolf by name lest the werewolves rend you. During the 16th century France was much infested with werewolves, the trial of Gilles Garnier at Dôle in 1573 being the most famous historical instance; and Olaus Magnus in the same period tells of specially accursed werewolves who were ferocious against the orthodox. There is a more kindly view in the "Bisclaveret" of Marie de France's *lai,* and in the romance of "William and the Werewolf"— more in keeping with the usual folklore notion of interchangeable transformation and mutual relationship between the human and the animal world. These superstitions have a connection with the obscure facts underlying totemism. Among various theories on the subject is the rationalistic explanation of an innate thirst for blood in some natures breaking out occasionally, together with hallucinations, into cannibalism. See FOLKLORE: TOTEM.

**Werff, Adriaan van der,** a Dutch painter; born near Rotterdam, Holland, in 1659; was a pupil of Van der Neer, and among his celebrated paintings are the "Judgment of Solomon," "Christ carried to the Sepulcher," "Ecce Homo," "Abraham with Sara and Hagar" and "Magdalen in the Wilderness." Van der Werff was particularly noted for his small historical pieces, which are most exquisitely finished, and still in high request. He died in Rotterdam in 1722.

**Wergeland, Henrik Arnold Thaulow,** a Norwegian poet; born in Christiansand, June 17, 1808; was graduated at Christiania in 1829. His early sympathies were fired by the July Revolution in France, the struggles of the Poles, and the rise of democratic sentiment in Norway. His first works were the so-called farces of "Siful Sifadda," "Ah!" (1827), and "Irreparabile Tempus" (1828), and "Digte, forste Ring" (1829). In the latter year he entered public life as one of the most eloquent opponents of the Conservative party. His religio-philosophical poem, "Skabelsen, Mennesket, og Messias" (1830), called forth the sharp criticism of Welhaven in 1832. Wergeland was for some time editor of "Folkebladet," and from 1835 to 1837 of "Statsborgeren"; and after the dissolution of the popular parliament in 1836 published a large number of violent party songs and pamphlets. His "Digte, anden Ring," as well as the drama "Barnemordersken" (1835), are full of the noblest lyric diction, and show a great advance on his earlier works in clearness. The friendly offices of King Karl Johan gradually won him over to the court; in 1839 a pension from the king succeeded in drawing him from the field of politics. To this later period belong some of his best poems, "Fan van Huysums Blomsterstykke," "Svalen," "Föden," "Födinden," and "Den Engelske Lods." His poems are published in nine volumes (1852–1859). He died in Christiania, Aug. 12, 1845.

**Wergeld,** the Old English title of a widespread institution, extending perhaps beyond the Aryan family, which, appealing from love of vengeance to love of gain, allowed a wrongdoer to purchase the life he otherwise had forfeited under a sterner code. It offers itself in its rudest form in the Homeric poems, where the kinsfolk of a slaughtered man seem only to have been bound by custom to take the proffered atonement, nay sometimes are praised for its rejection; in the earliest glimpses of Teutonic law a great advance may be discerned. For here not only has the State interefered to enforce the acceptance of the atonement and assess its amount, but it looks on a crime as done to itself, and so claims for its king or other head a share of the wergeld. Both in the laws of Æthelbert and in those of Ælfred three centuries later we find an elaborate scale of prices, so much for a Briton, so much for an Englishman, so much for a churl, so much for a thegn, so much at last for the king himself. And as the price must always be paid to him who had borne the loss, of a slave for instance to his master, so the king's wergeld had to be paid both to his kinsfolk and his commonwealth; and English history records two cases where the invading avenger of a royal kinsman slain was stayed by the payment of wergeld — by the Kentish men for the slaying of Mul, by the Mercians for the slaying of Ælfwine of Northumberland. With the severance of criminal from civil law, and the superseding of compensation by punishment, the wergeld grew obsolete, and the last recorded instance of its use was when in the reign of Edward IV. Lord Berkeley made the widow of Lord Lisle a money payment for her husband's death.

**Werner, Abraham Gottlob,** a German geologist; born in Wehrau, Ober-Lausitz, where his father was director of a smelting work, Sept. 25, 1750. In 1769 he entered the mining school at Freiberg, studying law and the natural sciences at Leipsic, and in 1775 became Professor of Mineralogy at Freiberg, where he soon formed a school of geologists and mineralogists who diffused his views over Germany. In this way, though he himself published comparatively little, his theories exercised a powerful influence on the science of the day. He systemized mineralogy, arranging minerals mainly by their external characters, and laying small stress on their chemical constitution. From a study of the Tertiary formations in his own district, beyond which he hardly ventured, he generalized a theory of the formation of strata, which his disciples strove hard to reconcile with the geological structure of other and distant regions which they visited. The gist of this theory was that all rocks were sedimentary. His system was vitiated, however, by his basing his classification chiefly on mineralogical characters, giving small heed to fossil evidences. His chief works are: "The External Characteristics of Fossils" (1764); "A Short Classification and Description of Mountains" (1787); "A New Theory on the Origin of Mineral Veins" (1791); and "A Description of the Mineralogical Cabinet of the Pope of Ohain" (2 vols. 1791–1792). He died in Dresden, June 30, 1817.

**Werner, Franz von** (vār'ner), known by his pseudonym "Murad Effendi," an Austrian author; born in Vienna, May 30, 1836. In 1877 he became resident minister at The Hague and Stockholm, and in 1886 was named minister plenipotentiary and

envoy extraordinary. He wrote: "Through Thurginia" (1870); "Marino Falieri" (1871); "Inez de Castro" (1872); "Mirabeau" (1875); "East and West," poems (1877); "Ballads and Pictures" (1879). His dramatic works were collected in 1881. He died in The Hague, Sept. 12, 1881.

**Werner, Friedrich Ludwig Zacharias,** a German dramatist; born in Königsberg, Germany, Nov. 18, 1768. His works are: "Sons of the Valley" (1800), inspired by Masonic enthusiasm; "Cruise in the German Ocean" (1804), set to music by Hoffmann; "Martin Luther"; and "The 24th of February," which made a great sensation and was widely imitated. Besides the dramas named, he wrote the tragedies "Attila," "Wanda," "Kunegunde," "The Mother of the Maccabees"; and lyrical poems, hymns, sermons, etc. He died in Vienna, Jan. 17, 1823.

**Wernerite** (after the mineralogist A. G. Werner), a name originally given by d'Andrada to some minerals from Norway which subsequently were found to vary in chemical composition, and are now known as the scapolites, wernerite being retained for the name of a member of the group; crystallization, tetragonal; hardness, 5–6; sp. gr., 2.63–2.8; luster, vitreous when pure, otherwise pearly to resinous; fracture sub-conchoidal. Composition, owing to its liability to alteration, somewhat variable, the mean being: Silica, 48.4; alumina, 28.5; lime, 18.1; soda, 5.0 = 100, with the formula $(\frac{1}{3}(CaONaO)_3 + \frac{2}{3}Al_2O_3)_2 3SiO_2 + SiO_2$.

**Wernigerode,** a town of Prussia, province of Sachsen; belonging to the Counts of Stolberg-Wernigrode; on the slopes of the Harz Mountains, at the confluence of the Zilligerbach and the Holtzemme; 40 miles S. W. of Magdeburg. It has a beautiful "schloss" containing a library of 69,000 volumes, specially rich in collection of Bibles and hymnologies, a gymnasium, three churches, a rathhaus dating from the 14th century, and built, as are also many of the private houses, in a picturesque Gothic style, a thiergarten or park, an orphanage, etc. Wernigerode has manufactures of linen, cloth, tobacco, and bricks. Pop. (1900) 11,567.

**Werthemanite** (after A. Wertheman), a massive mineral related to aluminite; sp. gr., 2.80; color, white; composition: hydrated sulphate of alumina, *e. g.*, sulphuric acid, 34.50; alumina, 45.0; sesquioxide of iron, 1.25; water, 19.25 = 100, which gives the formula $Al_2SO_6 + 3aq.$: this differs from aluminite in containing less water. Found in a bed of clay near Chachapoyas, Peru.

**Weser** (vā'zer), a river of Germany; formed by the junction of the Fulda and Werra at Münden; flows generally in a N. W. direction, and, after a very circuitous course, traverses the city of Bremen, and then falls by a wide mouth, much encumbered with sandbanks, into the German Ocean. Its length, including the Werra, is about 430 miles. The navigation for vessels of large size ceases about 10 miles below Bremen. See BREMEN.

**Wesley, Charles,** an English hymnist; born in Epworth, England, Dec. 29, 1708; younger brother of John Wesley; educated at Westminster School and Christ Church, Oxford. He accompanied his brother to Georgia as an ordained clergyman, but after his return to England he became, in 1738, a preacher in the Methodist connection, and materially assisted the success of the movement by his numerous hymns, large collections from which have been frequently published. Two of his sons, CHARLES and SAMUEL, were celebrated for musical genius. He died in London, March 29, 1788.

CHARLES WESLEY.

**Wesley, John,** an English clergyman; founder of Methodism; born in Epworth, England, June 17, 1703, son of the rector of Epworth; educated at the Charter House, and at Christ Church, Oxford. He took his degree of B. A. in 1724, was ordained deacon in 1725, became a fellow of Lincoln College, and lecturer and moderator in classics in 1726; and took priest's orders in 1728. He now gathered together a number of pupils and companions who met

JOHN WESLEY.

regularly for religious purposes, and by so doing acquired the name of Methodists. Among these companions were Hervey, Whitefield, and Law. In 1735 Wesley accepted an invitation from General Oglethorpe to go to America to preach to the colonists of Georgia. After a stay of two years he returned to England (February, 1738), and in the following May an important event took place in his inner religious life, namely, his conversion. In June he paid a visit to Herrnhut, the Moravian settlement, returning to England in September. Early in the following year (1739) he began open-air preaching, in which he was for a time associated with Whitefield. His first chapel was built in Bristol in 1739. Having now the sole control of the religious body which adhered to him, he devoted his entire life without intermission to the work of its organization, in which he showed much practical skill and admirable method. His labors as an itinerant preacher were incessant. He would ride from 40 to 60 miles in a day. He read or wrote during his journeys, and frequently preached four or five times a day. He held strongly to the principle of Episcopacy, and never formally separated from the Church of England. His collected works were published after his death in 32 volumes 8vo. He contributed to the collection of hymns, the greater part of which were written by his brother Charles. He died in London, March 2, 1791.

**Wesley, Samuel, Sr.,** an English clergyman; born in Winterborne-Whitchurch, England, in 1662. He was the father of CHARLES, JOHN, and SAMUEL, JR. He wrote "Life of Christ: An Heroic Poem," "Eupolis's Hymn to the Creator," etc. He is best known by the two hymns to be found in Methodist hymn books, "Behold the Saviour of Mankind," and "O Thou who when I did Complain." He died in Epworth, April 22, 1735.

**Wesley, Samuel, Jr.,** an English hymnist; born in London, Feb. 10, 1690, son of Samuel. He was head-master of Bundell's grammar school in Tiverton, in 1732–1739. He remained with the old High Church party, and did not embrace Methodism with his brothers. Editions of his poems have been published in 1736, 1743, and 1862 (with a Life, by William Nichols). He is best known by his hymns in the Methodist hymn book, and a poem beginning "The morning flowers display their sweets," written on the death of a young lady. He died in Tiverton, England, Nov. 6, 1739.

DEATH OF GENERAL WOLF, BY WEST.

**Wesleyan Methodism,** the largest and most important British Methodist denomination, and the parent of some smaller religious bodies now independent of its government.

**Wesleyan University,** a coeducational institution in Middletown, Conn. In 1830 the original buildings, North College and South College, which had been erected for a military academy, came into the possession of the New York and New England Conferences of the Methodist Episcopal Church; in 1831 a charter was obtained, and the university opened its doors and offered its services to aid in the training of students, who hitherto had been obliged to seek outside their Church the advantages of higher education. In 1872 the institution

was opened to women, quite a number of whom have been graduated with distinction. It has commodious buildings beautifully situated, a fine observatory, well-appointed laboratories and cabinets, and a large modern gymnasium. It reported at the close of 1901: Professors and instructors, 36; students, 350; volumes in the library, 59,000; productive funds, $1,405,615; grounds and buildings valued at $531,300; benefactions, $80,000; income, $96,552; number of graduates, 2,253; president, B. P. Raymond, D. D., LL. D.

**Wesselhoeft, Elizabeth ("Lily") Foster (Pope)** (wes'sel-hooft), an American writer; born in Dorchester, Mass., Oct. 20, 1840. Among her works are: "Jerry the Blunderer"; "Sparrow the Trump"; "Flipwing the Spy"; "Old Rough the Miser"; "The Winds, the Woods, and the Wanderer"; "Frowzle the Runaway"; "Fairy Folk of Blue Hill"; "Torpeanuts the Tomboy"; "Madam Mary or the Zoo"; "Doris and her Dog Rodney."

**Wessex** (West Saxons), one of the most important of the Anglo-Saxon kingdoms in England during the 6th, 7th, and 8th centuries, and the early part of the 9th, and that in which the other kingdoms were ultimately merged in the reign of Egbert in 827. It included the present counties of Devon, Dorset, Somerset, Wilts, Hants, Berks, and a part of Cornwall.

**West, Benjamin,** an American painter; born in Springfield, Pa., Oct. 10, 1738, of Quaker parents. After several years of portrait painting in Lancaster, Philadelphia, and New York city, he went to Rome, Italy, in 1760, and proceeded to England in 1763, where he made his permanent residence. One of his earliest friends was Dr. Drummond, Archbishop of York, who introduced him to George III., by whose order he executed his picture of "The Departure of Regulus from Rome," and whose patronage he enjoyed for about 40 years. On the death of Sir Joshua Reynolds, in 1792, West, who had been a member of the Royal Academy from its foundation, was elected president; which chair he enjoyed, with the exception of a short interval, till the close of his life. His "Death of General Wolfe" was among the first of his productions that attracted public notice, especially for the rational innovation on which he had ventured in it, of painting historical personages in a modern dress. Among his later works were "Death on the Pale Horse," and "Christ Healing the Sick." There is in the Pennsylvania Hospital, in Philadelphia, a copy (with some alterations) of "Christ Healing the Sick," which was presented to it by West. He died in London, March 11, 1820.

**Westayer, William A.** See Haupt, William Ayers.

**West Bay City,** a former city in Bay co., Mich.; annexed to Bay City in 1905; on the Grand Trunk and the Michigan Central railroads; 13 miles N. of Saginaw. It contains numerous churches, electric lights, electric railroads, National and State banks, and daily and weekly newspapers. It is connected with the old Bay City, directly opposite, by several bridges. It has sash, saw, flour, and planing mills, steel and wood shipyards, salt works, a large industry in lumber, and an assessed property valuation exceeding $3,600,000. Pop. (1900) 13,119. See Bay City.

**West Bromwich,** a parliamentary, municipal and county borough of Staffordshire, England; one of the most important towns in the great manufacturing and mining district known as the "Black Country," 5½ miles N. W. of Birmingham. The seat in the 12th century of a Benedictine priory, it yet is of modern growth, having risen within the last 100 years from a mere village on a barren heath, in consequence mainly of the rich coal and iron mines in the vicinity, of the industries to which these give rise, and of the transport facilities by rail and canal. The manufactures comprise all departments of Birmingham hardware. Puddling and sheet-iron rolling, sheet-glass making, coal mining, and brick and tile making are also carried on to a great extent. Pop. (1901) 65,172.

**Westbury, Richard Bethell, Baron,** an English jurist; born in Bradford-on-Avon, England, June 30, 1800; was graduated at Oxford, and was called to the bar in 1823. He became solicitor-general in 1852, attorney-general in 1856, and in 1861 succeeded Lord Campbell on the woolsack, taking his title from Westbury in Wiltshire. In the House of Commons he bore the burden of several important measures of law reform. In 1865 Westbury was compelled to resign office through the clamor against some official appointments, but was personally acquitted of unworthy motives. He opposed Gladstone's Irish Church Bill, and the Irish Land Act of 1870, and gave the last year of his life to arduous labor as arbitrator of the European Assurance Society. He died in London, July 20, 1873.

**West Chester,** a borough and county-seat of Chester co., Pa.; near the Brandywine river, and on the Philadelphia, Wilmington, and Baltimore, and the Pennsylvania railroads; 27 miles W. of Philadelphia. Here are a court house, State Normal School, Darlington Female Seminary, Villa Marie Convent, county hospital, public library, waterworks, street railroads, electric lights, National and private banks, and several daily and weekly newspapers. The borough has a print establishment, cold-storage works, creamery, and manufactures of wheels, carriages, hosiery, toys, artificial

ice, umbrellas, etc., and an assessed property valuation of nearly $7,000,000. Pop. (1900) 9,524; (1910) 11,767.

**Westcott, Brooke Foss,** an English scholar; born near Birmingham, England, in 1825; was educated at King Edward's School, Birmingham, and Trinity College, Cambridge. Elected fellow of his college in 1849, he took orders in 1851, and was an assistant master at Harrow from 1852 till 1869, when he became a canon of Peterborough. He was appointed Regius Professor of Divinity at Cambridge in 1870, chaplain-in-ordinary to the queen in 1879, Canon of Westminster in 1883, and in 1890 Bishop of Durham. He was one of the revisers of the Authorized Version of the New Testament, and his views had great influence in the deliberations. His edition of "The New Testament in Greek" was published in 1881, the result, conjointly with Dr. Hort, of the labors of 28 years. Among his writings are: "General Survey of the History of the New Testament Canon" (1855); "An Introduction to the Study of the Gospels" (1860); "The Bible in the Church" (1864); "A General View of the History of the English Bible" (1868); "The Religious Office of the Universities" (1873); "Some Thoughts from the Original" (1884); "The Revelation of the Father" (1887); "The Victory of the Cross" (1889); "The Historic Faith" (1890); "The Incarnation and Common Life" (1893); and "Lessons of the Revised Version" (1898). His commentaries are upon the Gospel of St. John ("Speaker's Commentary," 1882), the Epistles of St. John (1883), and the Epistle to the Hebrews (1889). Died July 28, 1901.

**Westenrieder, Lorenz von** (vest'en-rē-der), a German historian; born in Munich, Bavaria, Aug. 1, 1748. He became Professor of Poetry at Landshut, 1774; and of Rhetoric at Munich, 1776; literary censor, 1776; clerical senator, 1786; and was raised to the nobility, 1813. He did much for the elevation of the German language. His statue was erected at Munich in 1854. He wrote "History of Bavaria" (2 vols. 1785); "Contribution to the National History, Geography, Statistics, and Agriculture" (10 vols. 1785–1817); etc. He died in Munich, March 15, 1829.

**Westerly,** a city in Washington co., R. I.; on the Pawtucket river, and on the Stonington and Providence, and the New York, New Haven, and Hartford railroads; 6 miles N. E. of Stonington. It contains numerous churches, hotels, a high school, public library, Soldiers' Memorial Building, street railroads, electric lights, National and savings banks, and daily and weekly newspapers. Westerly is widely known on account of its extensive and excellent granite quarries. It has manufactories of flannel, cotton and woolen goods, and printing presses, and an assessed property valuation exceeding $6,500,000. Pop. (1890) 6,813; (1900) 7,541; (1910) 8,696.

**Western Australia,** one of the States of the new Commonwealth of Australia; includes all that portion of the continent situated W. of lon. 129° E. The territory measures 1,430 miles from Cape Londonderry in the N. to Peak Head in the S., and about 1,000 miles from E. to W. The total estimated area is 975,920 square miles, thus making it the largest of the former Australian colonies. The really occupied portion, apart from scattered settlements round the coasts, is almost entirely in the S. W., and is about 600 miles in length, and 150 miles in average breadth. Capital, Perth, on Swan river; pop. (1906) 52,300.

*Topography.*—The rivers in the S. W. are the Blackwood, Murray, Swan, Murchison, etc.; further N., the Gascoyne, Ashburton, Fortescue, De Grey, Fitzroy, etc., none of them navigable at all seasons. The interior of Western Australia is in great part sterile, with extensive tracts of scrub and salt marsh; but the colony is as yet imperfectly known. The S. W. has vast forests, which supply valuable timber for exportation, especially that known as jarrah. The Kimberley and N. districts contain boundless pastures, and there are lands suitable for the growth of sugar, tobacco, wheat, etc. In other parts are soils and climates admirably adapted for the cultivation of silk, olives, the vine, etc.

*Minerals.*—Gold is found at Kimberley and Yilgarn, and at several places between these districts, the chief fields being the Murchison, the Ashburton, and the Rilbarra. The Coolgardie field became prominent in 1895. The total value of the gold export of 1899 was $30,300,000. Copper and lead are found in abundance. The other chief minerals are coal, zinc, and iron. The pearl fisheries are rising in value.

*Government.*—In 1890 responsible government was conferred on the colony by the British Parliament in a new constitution vesting the administration in a governor and Parliament. The latter consisted of a legislative Council or Upper House and a Legislative Assembly or Lower House. Education is compulsory, but not free. In 1900 female suffrage was carried by the amendment to the constitution. The revenue for 1899–1900 was $13,988,800; expenditure, $12,825,258; debt, $55,592,037.

*History.*—Western Australia was first settled in 1829 as the Swan River Settlement, and for many years the population was very small; but in the year 1891 it had risen to 49,782. In 1850 it was made a convict station, and remained such till the abolition of transportation in 1868. Since that time it has been making gradual

progress. Pop. (1910) 273,534. See AUSTRALIAN FEDERATION.

**Western College,** a former name of LEANDER CLARK COLLEGE, a co-educational institution in Toledo, Ia.; chartered in 1856 under the auspices of the United Brethren Church; has productive funds exceeding $170,000; grounds and buildings valued at over $175,000; volumes in the library, about 6,000; average number of faculty, 17; average student attendance, 315.

**Western Empire, The,** a portion of the Roman empire, consisting of Italy, Illyricum, Spain, Gaul, Britain, and Africa, which Valentinian I. reserved for himself when in 364 he shared the imperial authority with his brother Valens, who reigned in Constantinople as Emperor of the East, and whose territories comprised the E. half of the Balkan Peninsula, Greece, Egypt, Syria, and Asia Minor, as far as Persia. This partition of the Roman empire became final in 395, when Theodosius the Great divided the Roman world between his two sons, Honorius, who became Emperor of Rome and the West, and Arcadius, who became Emperor of Constantinople and the East. The Western Empire terminated in 476. See BYZANTINE EMPIRE: ROME.

**Western Islands.** See AZORES: HEBRIDES.

**Western Maryland College,** a coeducational institution in Westminster, Md.; founded in 1867 under the auspices of the Methodist Protestant Church; has grounds and buildings valued at over $275,000; endowment, $50,000; volumes in the library, about 8,000; average number of faculty, 22; average student attendance, 225; graduates, over 710.

**Western Reserve, The,** a tract of land in the N. E. of what is now the State of Ohio, once forming part of the claims of Connecticut in the Northwest Territory. When, by the treaty of 1783, Great Britain relinquished the territory S. of the Great Lakes and E. of the Mississippi, disputes arose among the States of Virginia, New York, Massachusetts, and Connecticut as to the right of occupancy in that locality. The difficulty was finally settled by the cession of the whole to the Federal government, but Connecticut reserved a tract of nearly 4,000,000 acres on Lake Erie. The State finally disposed of this in small lots to colonists, and so accumulated a very large school fund.

**Western Reserve University,** a coeducational non-sectarian institution in Cleveland, O.; opened in 1826; has productive funds exceeding $2,000,000; grounds and buildings valued at over $1,500,000; volumes in the library, about 90,500; average number of faculty, 215; average student attendance, 1,000.



**Western Saratoga,** a name given to Waukesha, Wis., which has numerous mineral springs.

**Western University of Pennsylvania,** former name of the UNIVERSITY OF PITTSBURG, a co-educational, non-sectarian institution in Pittsburg, Pa., opened in 1787; has endowment of over $500,000; grounds and buildings valued at over $925,000; average number of faculty, 183; average student attendance, 1,300; graduates, over 2,400.

**Westfield,** a town in Hampden co., Mass.; on the Westfield river, and on the New York, New Haven, and Hartford and the Boston and Albany railroads; 9 miles W. of Springfield. It comprises the villages of West Farms, Little River, Middle Farms, Mundale, East Farms, and Westfield Center. Here are the Western State Normal School, public library, high school, churches, electric lights, waterworks, National and savings banks, and weekly and monthly periodicals. It has manufactories of organs, piano legs, paper, coffin trimmings, bicycles, steam heaters, cigars, whips, etc., and an assessed property valuation of nearly $8,500,000. Pop. (1890) 9,805; (1900) 12,310; (1910) 16,044.

**Westfield College,** a coeducational institution in Westfield, Ill.; opened in 1861; under the auspices of the United Brethren Church; has productive funds $25,000; grounds and buildings valued at over $60,000; volumes in the library, about 5,000; average number of faculty, 10; average student attendance, 165; graduates, over 200.

**West France.** See NEUSTRIA.

**West Hoboken,** a town in Hudson co., N. J.; opposite New York city and 2 miles W. of Hoboken. It adjoins the N. W. part of Hoboken and is built on elevated ground. Here are St. Michael's Monastery, a Dominican Convent, public and parochial schools, a public park, street railroads, electric lights, trust and savings banks, and weekly newspapers. It has manufactures of penholders, brushes, and silk goods, and an assessed property valuation of about $7,000,000. Pop. (1890) 11,665; (1900) 23,049; (1910) 35,403.

**West Indies,** or the **Antilles,** an extensive archipelago lying between North and South America, stretching from Florida to the shores of Venezuela. It is divided into the Bahamas, the group stretching from near the coast of Florida in a S. E. direction; the Greater Antilles, comprising the four largest islands of the group, Cuba, Haiti, Porto Rico, and Jamaica; and the Lesser Antilles, stretching like a great bow, with its convexity toward the E., from

West Indies

Porto Rico to Trinidad, near the coast of Venezuela. Almost the whole archipelago lies within the torrid zone. The total area does not exceed 95,000 square miles, of which the Greater Antilles occupy nearly 83,000 square miles. The climate is extremely hot, and the islands abound in tropical productions, as sugar, cotton, coffee, cacao, tobacco, maize, etc.; oranges, lemons, limes, pomegranates, citrons pineapples, manioc, yams, potatoes, etc. Except Haiti, in which there are two republics, Porto Rico and other islands recently acquired by the United States from Spain, and a few islands off the coast of South America, the West Indian Islands are in the possession of European powers. The chief British possessions are: Jamaica, Barbadoes, St. Lucia, St. Vincent, Trinidad, Tobago, Antigua, St. Kitt's, Dominica, Virgin Islands, and the Bahamas; Danish, Santa Cruz, St. Thomas, and St. John; Dutch, St. Eustatius, Saba, St. Martin (partly French), Bonaire or Buen Ayre, Curaçao, and Oruba or Aruba; and French, Martinique, Deseada, Guadeloupe, Marie Galante, St. Martin (partly Dutch), St. Bartholomew, and Les Saintes. Two-thirds of the inhabitants are negroes. Total pop. 5,000,000.

**West Indies, Danish,** three islands, St. Thomas, St. John, and St. Croix, which Denmark undertook to cede to the United States for $5,000,000 by treaty, Jan. 24, 1902. These islands lie off the E. coast of Porto Rico, and are, in fact, a mere extension of the marine elevation of which Cuba, Jamaica, Haiti and Porto Rico are the principal representatives, while they also form a connecting link between the Greater and the Lesser Antilles. St. Thomas, the best known of the group, lies 38 miles due E. of the N. E. extremity of Porto Rico; St. John lies 12 miles E. of St. Thomas, while St. Croix lies about 50 miles S. of St. John and St. Thomas, and 60 miles S. E. of the S. E. point of Porto Rico. Two small islands already belonging to the United States, Vieques and Culebra, which were obtained through the cession of Porto Rico, lie directly between Porto Rico and this newly added group.

The islands are small, with a comparatively small producing capacity, their chief importance being by reason of the harbors which they offer and their value as a strategic as well as general commercial point. St. Croix, the largest of them, is about 20 miles long and from 1 to 5 miles wide, with an area of about 80 square miles and a population of about 20,000. It is also the most productive of the islands, a considerable area being devoted to the production of sugar cane and tropical fruits, and agriculture being the occupation of a large proportion of the population. There are two towns on the island — Frederiksted, with a population of 3,700, and Christiansted, with a population of 5,500. The latter is on the chief harbor of the island, which, however, is choked with mud and is of less importance than the harbors of either of the other islands. St. John, the the smallest of the islands, has an area of about 21 square miles, a population of only about 1,000, and a comparatively small cultivable area, its chief value being in its possibilities for harbor purposes, the natural harbor of Coral Bay being described as one of the best protected natural harbors in the West Indies, but at present little used. St. Thomas, which lies nearest to Porto Rico, is by far the most important in its present availability for harbor purposes, the harbor of Charlotte Amalie having

been for more than a century recognized as one of the best, if not the best, natural harbors in the entire West Indies, and having been all that time a central point as a harbor of refuge and point of exchange for merchandise and a coaling station for vessels from all parts of the world. With passages through which it is easily reached, a good depth of water and excellent protection from the hurricanes to which that region is subject, it has long been regarded as an extremely valuable harbor, and when Denmark, in the early part of the 19th century, made it a free port, it became the distributing point for the commerce of the entire West Indian group. As a consequence nearly the entire population of the island is clustered around the port of Charlotte Amalie, fully 10,000 of the 12,500 population living in that city, and less than 2,000 being engaged in agriculture.

The introduction of steam and electricity within the last few years has reduced greatly the importance of St. Thomas as a point for the distribution of commerce, since now all of the islands in the group are visited by regularly plying steamships, and the trade supplied by this process, instead of being compelled to rely on the supplies formerly drawn from St. Thomas as a distributing point. The importance of the harbor, however, as a supply, repair, coaling and naval station has not been reduced, but rather increased, and with proper development it will, it is believed, prove of great value, while the productive possibilities of the islands, especially St. Croix, in the class of articles so largely imported by the United States — tropical productions — will not be inconsiderable. The population is chiefly colored, descendants of former slaves, who were liberated in 1848. English is the chief language spoken, especially in the island of St. Thomas, which has been for many years a resort for vessels from English-speaking countries.

The imports into St. Thomas alone in 1900 amounted to $733,000, and those of St. Croix about $420,000. They consist chiefly of foodstuffs and manufactures. The exports of St. Thomas in 1900 amounted to about $25,000 and those of St. Croix to $275,000. The exports of St. Thomas were of a miscellaneous character, largely manufactures destined for neighboring islands, while those from St. Croix were chiefly sugar and other tropical products for the United States markets. Of the $733,000 worth of imports into St. Thomas in 1900, $363,266 were from the United States, $148,002 from Great Britain, $98,044 from the West India islands, $53,058 from Germany, $25,372 from Belgium, $20,742 from British North America, and $14,402 from Denmark. Of the imports, the most important were flour, $53,770; cotton goods, $60,343; hardware, $11,114; rum, $13,872; cigars, $19,007; butter and oleomargarine, $16,497; cheese, $7,204; lard, $7,254, and other provisions, $21,128.

The future status of the inhabitants of the islands was fully set forth in Article III. of the treaty, which provides than Danish subjects residing in said islands may remain therein or remove therefrom at will, retaining in either event all their rights of property, including the right to sell or dispose of such property, or its proceeds; and in case they remain in the islands, they shall continue, till otherwise provided, to enjoy all the private, municipal rights and liberties secured to them by the laws now in force. If the present laws are altered, the said inhabitants shall not thereby be placed in a less favorable position in respect to the above mentioned rights and liberties than they now enjoy. Those who remain in the islands may preserve their allegiance to the crown of Denmark by making, before a court of record, within two years from the date of the exchange of ratifications of this convention, a declaration of their decision to preserve such allegiance, in default of which declaration they shall be held to have renounced it and to have accepted allegiance to the United States; but such election of Danish allegiance shall not, after the lapse of said term of two years, be a bar to their renunciation of their preserved Danish allegiance and their election of allegiance to the United States and admission to the nationality thereof on the same terms as may be provided according to the laws of the United States for other inhabitants of the islands. The civil rights and the political status of the inhabitants of the islands shall be determined by the Congress subject to the stipulations contained in the present convention. Danish subjects not residing in the islands, but owning property therein at the time of the cession, shall retain their rights of property, including the right to sell or dispose of such property, being placed in this regard on the same basis as the Danish subjects residing in the islands. The treaty was ratified by the United States Senate Feb. 17, 1902, but rejected by the Danish Landsthing Oct. 22, following.

**Westinghouse, George,** an American inventor; born in Central Bridge, N. Y., Oct. 6, 1846; removed to Schenectady, where he received a public school education; entered the machine shop of his father; and at the age of 15 designed a rotary engine. He served in the Union army in 1863–1864. His inventions include the Westinghouse air brake, electrical machinery, railroad signals, etc. In 1884 he was decorated with the Order of Leopold by the King of Belgium, and in 1889 with the Order of the Crown of Italy by the King of Italy.

**Westlake, William,** an American inventor; born in Cornwall, England, in 1831;

removed to Milwaukee, Wis., early in life; later learned the tinsmith's trade; was employed by Capt. John Ericsson to make models for his first hot-air engine. Subsequently he entered the employment of the Lacrosse and Milwaukee Railroad company. His inventions include the Westlake car heater, the globe lantern, the oil cook stove, the stove board, etc. He died in Brooklyn, N. Y., Dec. 28, 1900.

**Westmacott, Sir Richard,** an English sculptor; born in London, England, in 1775. In 1793 he went to Rome to study under Canova, and he gained the Pope's annual gold medal for sculpture. He also obtained a first prize for sculpture at Florence. In 1798 he returned to England, and rose rapidly in his profession. Many of the monuments in St. Paul's are from his chisel. He designed also the "Achilles" in Hyde Park, the statue of Lord Erskine in Lincoln's Inn Old Hall, that of Nelson in the Liverpool Exchange, besides statues of Addison, Pitt, etc. He was elected an associate of the Royal Academy in 1805, a full member in 1816, and in 1827 succeeded Flaxman as lecturer on sculpture. In 1837, he was knighted. He died in London, Sept. 1, 1856.

WESTMINSTER ABBEY.

**Westminster,** formerly a city of Middlesex, England, the seat of government and the residence of royalty, now a municipal borough of London, entitled to 10 aldermen and 60 councillors. Temple Bar (now removed) separated the two cities. Within the borough are Westminster Hall, Abbey, and School, Buckingham Palace, the Houses of Parliament, St. James's Palace, the Whitehall Banqueting House, etc. Pop. (1901) 182,977. See LONDON.

**Westminster Abbey,** the coronation church of the sovereigns of England, and one of the chief ornaments of London. It is a magnificent Gothic pile, situated near the Thames, and adjoining the Houses of Parliament. In 1065 a church was built here in the Norman style by Edward the Confessor. Part of this structure still remains in the pyx house and the S. side of the cloisters; but the main building, as it now stands, was begun in 1220 by Henry III. (who built the choir and transepts), and was practically completed by Edward I. Various additions, however, were made (including the nave and aisles, the W. front, and the Jerusalem Chamber) down to the time of Henry VII., who built the chapel which bears his name, while the upper parts of the two W. towers were designed by Sir Christopher Wren.

The extreme length of the church, including Henry VII.'s chapel, is 531 feet; breadth of transepts, 203 feet; height of roof, 102 feet; height of towers, 225 feet. The coronation ceremony takes place in the choir, where the coronation stone brought by Edward I. from Scotland is situated beside the coronation chairs of the English sovereigns. Westminster Abbey is distinguished as the burial-place of a large number of English kings from Edward the Confessor to George II.; the N. transept is occupied chiefly by monuments to warriors and statesmen; while in the S. transept is situated the "Poets' Corner," the burial and memorial place of most of England's great writers from Chaucer to John Ruskin. See LONDON.

**Westminster Abbey of the Florentines,** a name given to the Church of Santa Croce, in Florence, where Michael Angelo and many others equally eminent are entombed.

**Westminster Assembly,** an assembly of divines, lay assessors, etc., which met in

obedience to an ordinance of the British Parliament, issued June 12, 1543:

"For the calling of an assembly of learned and godly divines to be consulted with by the Parliament for the settling of the government and liturgy of the Church of England, and for the vindicating and clearing of the doctrine of the said Church from false aspersions and interpretations."

There were 120 clergymen, with 10 lords and 20 commoners, or lay assessors, nominated to carry out the ordinance. The meeting was forbidden by the king on June 22, but no notice was taken of the prohibition. On July 1, 69 of the nominated members attended in Henry VII.'s Chapel in Westminster Abbey, and the assembly began. They sat 1,163 times, their last meeting being on Feb. 22, 1649. On Sept 15, 1643, commissioners arrived from the Church of Scotland to aid in the deliberations. On April 20, 1643, the Assembly submitted to Parliament a Directory for Public Worship; between Oct. 1 and Nov. 26, 1644, the Confession of Faith, in two portions; on Nov. 5, 1647, the Shorter Catechism; and on Sept. 15, 1648, the Longer Catechism. The great majority of the members were Presbyterians, a small but active body were Independents, and a yet smaller one, but containing able men, were Erastians. The Parliament itself was Erastian, and, though accepting and ratifying the productions of the Assembly, did not allow the spiritual independence which the majority of its members earnestly desired to obtain. See CONFESSION OF FAITH.

**Westminster College,** a coeducational institution in New Wilmington, Pa.; founded in 1852, under the auspices of the United Presbyterian Church; has an endowment exceeding $160,000; grounds and buildings valued at over $245,000; scientific apparatus, etc., $30,000; volumes in the library, about 14,000; average number of faculty, 24; average student attendance, 315; graduates, over 1,500.

**Westminster Hall,** the hall of the old palace of Westminster, in London; erected by Richard II. (1397–1399) on the foundations of a structure built by William Rufus. It has a fine porch, and its hammer-beam roof of carved timber is considered the most notable of its kind; length of the building, 290 feet, breadth 68 feet, and height 110 feet. The building is closely associated with many stirring events in English history; but it is chiefly remarkable as the place where were held such great state trials as those of the Chancellor More, Lady Jane Grey, the Earl of Strafford, King Charles I., and Warren Hastings, and as the center of the highest English courts of law till these were removed to the new buildings erected for thir accommodation. The hall now serves as a fine vestibule to the Houses of Parliament.

**Westphalia,** the name given at different periods to (1) one of the circles of the old German empire, (2) one of Napoleon's kingdoms (1807–1813), conferred on his brother Jerome; and (3) now to a province of Prussia. The latter is bounded by Rhenish Prussia, Holland, Hanover, Brunswick, Hesse, and Nassau. Its area is 7,803 square miles. The surface in the S. and N. E. is generally mountainous; the Northwest spreads out into extensive and often marshy plains, and belongs to the basin of the Ems; the Northeast and a small part of the East to the basin of the Weser; the remainder, constituting the far larger portion of the whole, belongs to the basin of the Rhine, whose chief tributaries are the Ruhr and Lippe. Besides iron and coal in abundance the minerals include copper, lead, zinc, marble, slate, sulphur, antimony, and salt; and the manufactures are varied and important. The province is divided into the three circuits of Münster, Minden, and Arnsberg. Münster is the capital. Pop. (1905) 3,618,090.

**Westphalia, Peace of,** the name given to the peace concluded in 1648 at Münster and Osnabrück, by which an end was put to the Thirty Years' War. By this peace the sovereignty of the members of the empire was acknowledged. The concessions that had been made to the Protestants since the religious peace in 1555 were confirmed. The elector-palatine had the palatinate of the Rhine and the electorate restored to him; Alsace was ceded to France; Sweden received Western Pomerania, Bremen, Verden, Wismar, and a sum equal to $3,750,000; Brandenburg, Mecklenburg, Hanover, and Brunswick were compensated by the secularization of numerous ecclesiastical foundations. The independence of the United Provinces was recognized by Spain, and that of Switzerland by the empire. See THIRTY YEARS' WAR.

**West Point,** a United States military post in Orange co., N. Y.; on the Hudson river, and on the West Shore and the New York, Ontario and Western railroads; 52 miles N. of New York city. It is widely known as the seat of the United States Military Academy. Here are a cemetery where the remains of many distinguished army officers are interred, and the ruins of Fort Putnam. During the Revolutionary War West Point was fortified to control the river, and a heavy chain was stretched across the river to Constitution Island to prevent British warships from ascending the river. In 1777 the place was captured and destroyed by the British, but new fortifications were built at a cost of $3,000,000. Benedict Arnold was given command of the place Aug. 5, 1780, but escaped on the 25th, after the apprehension of Maj. John André, and the discovery of their plot.

West Point

There are several important monuments in West Point, including the statue of General Sedgwick, the monument of Kosciusko, that of Major Dade, etc. The noted West Point foundry is at Cold Spring on Constitution Island.

Historic West Point is preparing for great topographical and structural changes. Those in charge of the academy have asked Congress for $6,000,000 to improve most of the old buildings, tear down some of them, and construct many new ones. The House of Representatives, having cut the sum down to $5,000,000, passed the appropriation bill in 1902. The Senate passed the measure, after adding again the $1,000,000 that had been cut off.

The plan involves the destruction of only a few of the old buildings, the addition of up-to-date structures, and the improvement of the ones about which are clustered the memories that the old soldiers love.

Col. Charles W. Larned, Professor of Drawing at the academy, who drew the plans and made the estimates, says in his report to Congress: "It is not desirable that any scheme should attempt to sweep the field clean and destroy architectural associations made honorable by generations of great men, while it is of the highest importance to preserve intact the structural sentiment which gives character and individuality to the academy. It would be a very great pity to make such an institution the subject of an architectural thesis in which the heritage of past days plays no part."

The work is to be started as soon as the money is forthcoming from the United States treasury. The old buildings to be torn down include the chapel, the administration building, the cadet store, and a group of officers' quarters. They are to make room for some of the new structures, which will include an academic hall, a contagion hospital, post headquarters, a chapel, a cadet store, elaborate quarters for bachelor officers, a guardhouse, a post exchange, a power house for a lighting and heating plant, an artillery barracks, and some stables, 20 or more houses for married officers, additional cadet barracks, a new wing to the gymnasium, a riding hall that is to be the largest in the world, a new hotel, barracks for enlisted men, and many other outlying buildings that are needed by cadets, officers and soldiers.

The new academic building with a lofty clock tower in front, will occupy the sites of the present administration building and chapel across the roadway from Academy hall. The old and new academic buildings are to be connected by a triumphal arch of ornate design, and it is to be the feature of the improvement in which Colonel Larned takes special prade. The plan of it shows that a roadway for carriages will run under the center and two asphalted sidewalks are to be constructed under each side. Over the walkways are to be large commemorative bronze tablets, the inscriptions on which will tell of the deeds of Washington, Grant, and other heroes.

The arch is to be at the main entrance to the academy grounds, the first thing to be seen in ascending the hill from the railroad station. Near the bronze tablets, and between two small ornamental towers, is to be a stone reproduction of the Military Academy's coat of arms.

To any one looking toward West Point from the Hudson river the new riding hall will be the most impressive of all the proposed buildings. It will stand on a solid rock cliff, rising high above the water and presenting the appearance of an ancient feudal castle. It is to be 600 feet in length and 125 feet in width — dimensions that are greater than those of any other building of the kind in the world. The tower at each corner is to be castellated, and a formidable tower-guarded gateway, built for antique effect instead of use, will command a view of the river.

The plan of new cavalry and artillery drill grounds involves a change that will improve the appearance of the post as much as any other innovation. In the past the drills have been conducted on a grassless, gravelly stretch on the E. half of what is known as the plain — the area that extends from the cadets' barracks to the West Point hotel many hundred yards away. The establishment of a new parade ground for artillery and cavalry means that the bleak expanse, an eyesore among the beautiful surroundings of turf and trees, can be transformed into a green sward like the rest of the plain.

When sodded the plain is to be used only for infantry drills and, as in the past, for such athletic sports as do not necessitate the destruction of the grass. There the football and baseball teams and the golf enthusiasts will practise between duty hours.

The gymnasium is to be enlarged to twice its present size, and a swimming tank 100 by 36 feet is to be one of the features. The main floor is to be lengthened to 180 feet, and in a wing of three stories are to be bowling alleys, shuffleboards, handball courts, a batting cage, an indoor baseball practice field, and a tennis court.

The new chapel is to be on Trophy Point, overlooking and visible from the river. It is to be one of the handsomest of the proposed additions, and has been designed to accommodate, with plenty of room to spare, more than 1,300 persons. The present chapel has been inadequate for years, its crowded capacity being not more than 500. On the site of the West Point hotel is to be a park, in the center of which it is proposed to

West Virginia

There are several important monuments in West Point, including the statue of General Sedgwick, the monument of Kosciusko, that of Major Dade, etc. The noted West Point or Cold Spring Foundry is on Constitution Island, which was presented to the Government in 1908 by Mrs. Russell Sage and Miss Anna Bartlett Warner jointly. See MILITARY ACADEMY, UNITED STATES.

**West Virginia,** a State in the South Atlantic Division of the North American Union; bounded by Pennsylvania, Maryland, Virginia, Kentucky, and Ohio; admitted to the Union, June 20, 1863; capital, Charleston; number of counties, 55; area, 24,780 square miles. Pop. (1910) 1,221,119.

*Topography.*— The State is hilly and mountainous. The Alleghany Mountains form the Virginia boundary line. A continuation of the Cumberland Mountains of Tennessee crosses the State about 20 miles W. of the Alleghanies. This range embraces the Flat Top, Cotton Hill, Greenbrier, Gauley, and Rich mountains. The surface W. of these mountains gradually descends to the Ohio river, this river forming the principal water system of West Virginia. The chief rivers are the Big Sandy, Kanawha, Guyandotte, and Monongahela, all of which are navigable and enter the Ohio. The Kanawha is fed by the Greenbrier, Gauley, Elk, and Coal rivers. The Potomac river forms part of the N. boundary line. There are numerous waterfalls in these streams all of which afford excellent water power, the falls at Harper's Ferry being especially noted.

*Geology and Mineralogy.*— The E. portion of the State is of Eozoic formation. This is bordered by Lower Silurian shales, limestone and medina sandstone, and by coal measures covering over 16,000 square miles. Every known variety of coal is mined in the State, the production in 1900 being 22,647,207 short tons, valued at $18,416,871. West Virginia ranked second in the United States in the output of petroleum, 16,195,675 barrels, valued at $21,922,702. Other important mineral productions were coke, 2,358,499 short tons, valued at $4,746,633; salt, 243,873 barrels, valued at $151,662; mineral water, 19,325 gallons, valued at $10,723; natural gas, valued at $2,959,032; clay products, $1,451,539; sandstone, $65,615; and limestone, $53,701.

*Agriculture.*— The soil consists of disintegrated limestones, sand, clay, and loam, giving it exceeding fertility. Nearly all garden vegetables and cereals grow abundantly. The principal farm crops in 1900 were corn, 19,299,708 bushels, valued at $9,649,854; wheat, 4,452,895 bushels, valued at $3,428,729; oats, 2,768,451 bushels, valued at $941,273; rye, 127,796 bushels, valued at $81,789; buckwheat, 223,958 bushels, valued at $125,416; potatoes, 3,029,120 bushels, valued at $1,544,851; and hay, 547,600 tons, valued at $7,337,840.

*Manufactures.*— There were reported by the United States census in 1900, 4,419 manufacturing establishments, employing $55,719,938 in capital, and 33,085 persons; paying $12,876,902 for wages and $42,632,813 for materials used; and having finished products valued at $74,177,681. The principal articles of manufacture were iron and steel, lumber, and timber products, flour and grist, coke, railroad cars, packed meat, tobacco, cigars, and cigarettes, pottery, malt liquors, glass, foundry and machine shop products, and clothing.

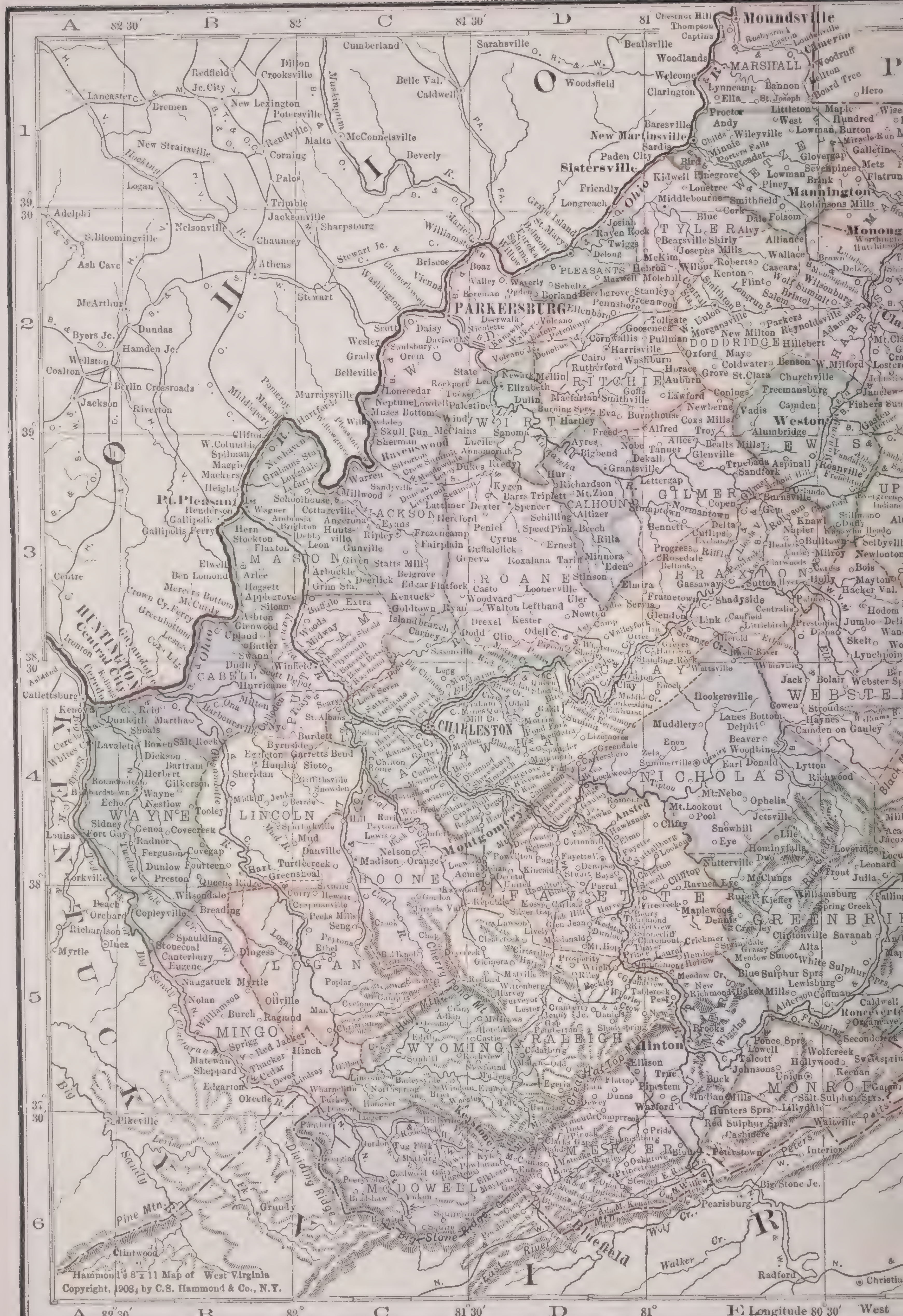
*Banking.*—On Oct. 31, 1901, there were reported 46 National banks in operation, having $4,046,000 in capital; $3,057,304 in outstanding circulation; and $2,797,250 in United States bonds. There were also 101 State banks, with $4,165,177 capital, and $1,327,480 surplus; and 1 mutual savings bank with $563,264 in savings deposits. The exchanges at the United States clearing house at Wheeling, during the year ending Sept. 30, 1901, aggregated $20,346,860.

*Education.*— At the end of the school year 1899–1900 the children of school age numbered 322,390; the enrollment in public schools, 232,343; and average daily attendance, 151,254. There were 5,916 public school buildings, public school property valued at $3,966,014, and 7,179 teachers. For higher education there were 26 public high schools, 14 private secondary schools, 6 State normal schools, 2 State preparatory schools for the university, Barboursville College at Barboursville, Broaddus Institute, at Clarksburg, W. Va., Methodist Episcopal Conference Seminary at Brickhannon, Bethany College at Bethany, West Virginia University at Morgantown, Ohio Valley College, Ravenswood, Lewisburg Female Seminary at Lewisburg; 2 State colored institutes at Farm and Bluefield; also several large Catholic educational institutions at Wheeling, Parkersburg, and other cities.

*Churches.*— The strongest denominations in the State are the Methodist Episcopal, North; Regular Baptist; Methodist Episcopal, South; Roman Catholic; United Brethren; Methodist Protestant; Presbyterian, South; Disciples of Christ; Presbyterian, North; Colored; and Dunkards. In 1899 there were 2,024 Evangelical Sunday-schools with 20,545 officers and teachers, and 152,945 scholars.

*Postoffices and Periodicals.*— On Jan. 1, 1901, there were 1,956 postoffices of all grades; and 191 periodicals, of which 20 were daily, 2 semi-weekly, 154 weekly, 1 bi-weekly, 2 semi-monthly, 11 monthly, and 1 quarterly.

*Railroads.*— The total length of railroads within the State, Jan. 1, 1901, was 2,457


Hammond's 8 x 11 Map of West Virginia
Copyright, 1908, by C.S. Hammond & Co., N.Y.
A
B
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E
82 30′
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Longitude 80 30′ West
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O H I O
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MARSHALL
WETZEL
TYLER
PLEASANTS
WOOD
WIRT
RITCHIE
DODDRIDGE
HARRISON
LEWIS
GILMER
CALHOUN
JACKSON
MASON
ROANE
BRAXTON
PUTNAM
CABELL
KANAWHA
CLAY
WEBSTER
NICHOLAS
WAYNE
LINCOLN
BOONE
FAYETTE
GREENBRIER
LOGAN
MINGO
WYOMING
RALEIGH
SUMMERS
MONROE
MERCER
McDOWELL
Moundsville
New Martinsville
Sistersville
Mannington
PARKERSBURG
Weston
CHARLESTON
HUNTINGTON
Central City
Pt.Pleasant
Montgomery
Ansted
Hinton
Bluefield
Ohio R.
Kanawha
Big Sandy
Tug Fk.
Dividing Ridge
Big Stone Ridge
Great Flat Top Mtn
Pine Mtn.
Lancaster
Logan
Athens
Marietta
Gallipolis
Ironton
Catlettsburg
Pikeville
Grundy
Pearisburg
Radford
Lewisburg
Sutton
Spencer
Ripley
Elizabeth
Harrisville
Middlebourne
Wayne
Hamlin
Madison
Williamson
Princeton
Union
Beckley
Fayetteville

# WEST VIRGINIA

SCALE OF MILES

0 10 20 30 40

State Capitals ⊛ County Seats ⊙

Size of type indicates relative importance of places

## NORTHERN PORTION OF WEST VIRGINIA

Same scale as main map.

miles, of which, 225 miles were constructed during the previous year.

*Finances.*— West Virginia has no public debt. On Feb. 1, 1902, the amounts in the various State funds, aggregated $2,013,872.72, of which $435,773.25 was uninvested funds of the irreducible school fund and $622,600 was invested funds of the irreducible school fund. The assessed property valuation in 1899 was, real estate, $149,898,172; personal property, $56,158,736; railroad property, $22,352,381; total, $228,409,289; State tax rate, $2.50 per $1,000; and school tax, $1 per $1,000.

*State Government.*— The governor is elected for a term of four years and receives a salary of $2,700 per annum. Legislative sessions are held biennially in odd years, beginning on the second Wednesday in January, and are limited in length to 45 days each. The Legislature has 30 members in the Senate, and 86 in the House, each of whom receives $4 per day and mileage. There are 5 Representatives in Congress under the new appointment. The State government in 1902 was Republican.

*History.*— The history of the State prior to 1861 is identified with that of Virginia proper, of which State it formed part till after the outbreak of the Civil War. The Alleghany Mountains, however, formed a natural line of demarkation between the two sections of the original State, and conditions favoring separation had long existed. These reached a climax on the passage by Virginia of an ordinance of secession, the popular vote in the section W. of the mountains being strongly opposed to it. A convention of loyalists met at Wheeling in June, 1861, and in August adopted an ordinance providing for the formation of a new State to be called Kanawha. In November a constitution was adopted and the name West Virginia chosen. This constitution was adopted by the people by a very large majority in April, 1862, and the State was formally admitted to the Union by Act of Congress and the approval of President Lincoln, June 20, 1863.

**West Virginia University,** a coeducational non-sectarian institution in Morgantown, W. Va.; opened in 1868; has endowment exceeding $116,000; grounds and buildings valued at over $850,000; scientific apparatus, etc., $84,000; volumes in the library, about 40,000; average faculty, 66; average students, 1,300; graduates, over 1,500.

**Westward Ho,** a seaside resort on the coast of North Devon, England, 2½ miles W. of Bideford. It owes its existence to Charles Kingsley's Elizabethan romance (1855), of the same name, which attracted swarms of visitors to North Devon. For their accommodation this pretty cluster of villas and lodging houses, with its church, hotel, club house, and college, has sprung up since 1867. The bathing facilities are excellent, and it is a great resort of golfers. The village is in the parish of Northam.

**Wetherellia** (named by Bowerbank after his friend, N. T. Wetherell, of Highgate, London, England, who had long studied the London Clay), a genus of fossil fruits from the London Clay. The pericarp was three, four, or five celled, each cell with a single seed inclosed within a thin compressed sac, pubescene internally. Sac surrounded by cellular tissue, which was divided into two lobes as the fruit expanded. Seeds pendulous, nearly three times as long as broad, compressed sideways, attached to a central placenta by a short funiculus; testa reticulated. Only known species *W. variabilis*, the most abundant of the Sheppey fossil fruits, locally known as coffee.

**Wetherell, Elizabeth.** See WARNER, SUSAN.

**Wet-sheet Packing,** in therapeutics, the packing or envelopment of a patient in a sheet dipped in cold or tepid water and well wrung out. Round this a blanket is rolled, and other blankets added above. The patient is usually thrown into a healthful perspiration.

**Wetstein, Johann Jakob,** a Swiss New Testament scholar; born in Basel, Switzerland, March 5, 1693. He studied theology and became assistant to his father in St. Leonard's Church at Basel. His boldness and originality in treating the New Testament text soon brought him under suspicion of heterodoxy, and he was deposed for alleged Socianism (1730). But in 1733 he was called to the chair of Church history in the Remonstrants' College at Amsterdam, and there he lived till his death, March 22, 1754. The prolegomena to his famous edition of the Greek Testament appeared anonymously in 1730; the text followed in two volumes folio, 1751–1752.

**Wetter,** a lake in Sweden; about 24 miles S. E. of Lake Wener; greatest length, 80 miles; medium breadth, about 15 miles. Its height above the level of the Baltic is nearly 300 feet, but its depth is in some parts above 400 feet. The Wetter forms part of the canal connection between the Cattegat and the Baltic. The chief town on its shores is Jönköping.

**Wetterhorn** ("peak of tempests"), one of the most striking peaks of the Bernese Oberland; has three summits — the W., called by the natives Hasli-Jungfrau, 12,147 feet high; the middle, known as the Mittelhorn, 12,165 feet; and the E., the Rosenhorn, 12,110 feet. These were ascended first in 1844 and frequently since, the ascent, being made from Grindelwald, and the previous night spent at a club hut built among the rocks, at the foot of the main

peak. The contrast between the bright fresh pastures and the black precipices and dazzling snow ridges of the Wetterhorn is particularly striking, making the valley of the Reichenbach a favorite resort of artists.

**Wetzer, Heinrich Joseph,** a German theologian; born in Anzefahr, Hesse, Germany, March 19, 1801; studied at Marburg, Tübingen, and Paris, became Professor of Oriental Philology at Tübingen in 1830. He began the publication of "The Church Lexicon of Catholic Theology" in joint editorship with Benedikt Welte in 1846; the 12th volume appeared in 1860. He died in Freiburg, Germany, Nov. 5, 1853.

**Wetzlar,** a town of Rhenish Prussia; on the Lahn; 95 miles S. E. of Köln. It has a cathedral, built at intervals during the 13th, 14th, and 15th centuries, and still unfinished. Protestants worship in the choir, Catholics in the nave. There are also a gymnasium and a synagogue, and glove factories, spinning, iron works, phosphorus works, etc. Wetzlar is a scene in Goethe's "Werther." It first appears in history during the 12th century. The Diet of Spires met here from 1689 to 1808.

**Wexford,** the capital of the county of the same name, in Ireland, 93 miles S. of Dublin; at the mouth of the Slaney river, which here expands to form a harbor 6 miles long. It contains three Roman Catholic churches, two Episcopal, one of which, St. Selsker, dates from about 1200, and meeting houses belonging to minor sects, St. Peter's College, a preparatory school for Maynooth, a diocesan Protestant school, and various others. The trade is chiefly retail, but corn, poultry, and oysters are shipped to Liverpool, with which there is regular steamboat communication. The harbor is finely situated, but a bar at its mouth prevents the entrance of any but small vessels. Parts of the old fortifications and of St. Selskar's priory remain. The town is extremely ancient, and was occupied by the Danes as one of their strongest settlements; and from the time of the invasion it became an English stronghold against the native population. During the civil wars of 1641 it was occupied by the confederate Catholics, but was taken by Cromwell in 1644. The insurgents of 1798 also had possession of it for a short time. Pop. (1901) 11,154.

**Weyer, Sylvain van de,** a Belgian statesman; born in Louvain in 1802; studied law there, and subsequently practised at the bar in Brussels till apointed city librarian, keeper of the Burgundian archives, and professor at the museum. These appointments he lost in consequence of his becoming leader of the opposition and coeditor of the "Courrier des Pays-Bas." After the Revolution of 1830 he was a member of the Committee of Public Safety, and of the Provisional Government, and in the National Congress was a zealous advocate of the exclusion of the House of Orange. In November, 1830, he was commissioned to confer with the English cabinet, and on his return he became president of the Diplomatic Committee and minister of Foreign Affairs (Feb. 26, 1831). On the accession of Prince Leopold, Weyer was appointed ambassador to England. Recalled in 1845 to form a new cabinet, he failed as minister of Interior to reconcile the Liberal and Catholic parties, and in 1846 returned to his former post in London, which he held till his resignation in 1867. His literary works are published under the title "Choix d' Opuscules Philosophiques" (5 vols. 1863 *et seq.*). He died in London, May 23, 1874.

**Weyer's Cave,** a cave in Augusta co., Va., near Staunton. It is richly decorated with stalactites. See STALACTITES.

**Weyler, Valeriano,** a Spanish military officer; born in 1839 of a Prussian father and Spanish mother. He early obtained a record for excessive barbarity. He arrived at Havana, Cuba, as Captain-General of the island on Feb. 10, 1896. Here he further established his infamy by his cruel and inhuman treatment of the Cubans, and earned for himself the name of "Butcher Weyler." In his management of Cuban affairs Weyler had the support of the home government. He was succeeded by General Blanco in the later part of 1897; became Minister of War in 1902; and commanded the troops mobilized to prevent religious demonstrations against the Government, because of its rupture with the Vatican in 1910. See BLANCO, RAMON Y ARENAS: CUBA.

**Weyman, Stanley John** (wī'man), an English novelist; born in Ludlow, Shropshire, England, Aug. 7, 1855; was educated at Christ Church, Oxford; became classical instructor in the King's School, Chester, in 1878; called to the bar in 1881, and practised till 1890. He contributed to periodicals in 1883, and published in book form the historical romances: "The House of the Wolf" (1890); "Francis Cludde" (1891); "The New Rector" (1891); "A Gentleman of France" (1893); "Under the Red Robe" (1894); and "My Lady Rotha" (1894); "Memoirs of a Minister of France"; "The Red Blockade" (1895); "The Man in Black" (1896); "Shrewsbury" (1897); 'The Castle Inn" (1898); etc. Several of his stories have been dramatized.

**Weymouth,** a seaport and market town of England, in Dorsetshire, comprising the town and chapelry of Weymouth and the town and parish of Melcombe, the former on the S. and the latter on the N. side of the Wey, 8 miles from Dorchester. Weymouth is old and poorly built. It communicates with Melcombe, to which it is united

by a handsome bridge. It became a place of fashionable resort, in consequence of its being frequented by George III., and is now greatly enlarged by the addition of many new and elegant buildings. Pop. (1901) 19,843.

**Weymouth,** a town in Norfolk co., Mass., on the South Shore line of the New York, New Haven and Hartford railroad; 12 miles S. E. of Boston. The town contains the villages of North Weymouth, East Weymouth, Weymouth Center, South Weymouth, Weymouth Heights, Nash, Lovell's Corner, Old Spain, and Weymouth Landing. It is a seashore summer resort, but has extensive manufacturing and shipbuilding interests. The principal manufactures include boots, shoes, fertilizers, fireworks, hammocks, boxes, and clothing. There are daily and weekly newspapers, a National bank, electric lights, and street railways, public schools, public library, and an assessed property valuation of over $7,000,000. It is the second oldest town in the State, having been incorporated Sept. 2, 1635. Pop. (1900) 11,324; (1910) 12,895.

**Whale,** a name that may be taken as equivalent to Cetacean, and applied to any member of that order of mammals, which

COMMON WHALE.

includes two great sets: the toothed whales, such as sperm whale and dolphin, and the whalebone whales, such as right whale and rorqual, in which the teeth are only embryonic. The order *Cetacea* is usually divided into three sub-orders: (1) the *Mystacoceti* or *Balænoidea,* baleen or whalebone whales; (2) the *Odontoceti* or *Delphinoidea,* toothed whales; and (3) the *Archæoceti* or extinct Zeuglodonts. The differences between tne extant sub-orders are so great that any idea of the close relationship must be abandoned; their common ancestry must be far back, and indeed it is doubtful whether our classification might not be brought nearer the truth by recognizing two distinct orders. Less specialized than the modern types are the extinct Zeuglodonts of the Eocene period, but it is by no means certain that they should be included within the order *Cetacea.*

*Baleen Whales.*—Baleen consists of a double series of 300 to 400 horny plates, which grow from the palate and hang down into the mouth. Each plate is somewhat triangular, the base being rooted in the palate; both apex and inner edge are frayed into hairy shreds. These plates grow from parallel ridges on the palate, which are covered with long vascular papillæ. These papillæ became horny and fuse together to form the plates. The whale is wont to swim with open mouth through shoals of pelagic animals; having secured a good mouthful, it closes its jaws, raises its tongue, allows the water to strain out at the sides through the baleen plates, on the edges of which the food is caught. Thence it is swallowed. In short, the apparatus serves as a strainer or sieve.

There are five extant genera of baleen whales, of which the best known are the right whales (*Balæna*) and the rorquals (*Balænoptera*). In the genus *Balæna* the skin of the throat is smooth, there is no dorsal fin, the neck vertebræ are fused, the fore-limb is short, broad, and five-fingered, the head is very large the baleen plates are very long, narrow, and black. The Greenland or Arctic right whale, or bowhead (*Balæna mysticetus*), of circumpolar distribution, measures 45 to 50 feet in length, the head forming more than one-third of the whole. It surpasses every other species both in quantity of oil and in length, quantity, and quality of whalebone, a large example yielding 275 barrels of the former, and 1¾ tons of the latter. The blubber may be 16 inches in thickness. The huge animal feeds for the most part on very minute crustaceans. The southern right whale (*B. australis*) inhabits the temperate seas of both hemispheres, apparently with local varieties in different regions. In many ways it resembles the Arctic species, but has a relatively shorter head, shorter baleen, and a different body contour. The humpback (*Megaptera boops*) is about the same size as the Arctic right whale, but has the skin of the throat plaited, a low hump-like dorsal fin, free neck vertebræ, very long and narrow four-fingered pectoral limbs, a head of moderate size, short and broad baleen plates. It is common in the North Atlantic between Norway and Greenland, and occasionally visits British coasts. Other forms, perhaps of the same species, occur in the South Atlantic and in the Pacific. The two other extant genera of *Balænoidea* are represented by the rare *Neobalæna marginata* from Australian seas, the smallest of whalebone whales, not exceeding 20 feet in length; and *Rhachianectes glaucus,* the gray whale of the North Pacific, from 35 to 40 feet long.

*Toothed Whales.*—The *Odontoceti* are represented by many more forms than the *Mystacoceti,* and there is a much greater diversity of type. The cachalot, or sperm whale (*Physeter macrocephalus*), the only

representative of its genus, is a huge cetacean widely distributed in "schools" in tropical and subtropical seas. "The length of the full grown male is from 55 to 60 feet, but the female is stated not to reach more than half that size." The lower jaw bears on each side 20 to 25 strong, conical, recurved teeth, fixed in a long groove and not in distinct sockets; the shape of the skull is very unlike the shape of the head, for while there is a very long rostrum and a deep basin-like concavity on the upper surface of the skull, the head is rounded and truncated in front; the bulk of the head above the cranium consists of tough fat or "junk," but above this there is a large "case" containing fluid oil and a granulated substance which yields "spermaceti"; there is a very long mandibular symphysis; the head is about a third of the total length; the somewhat sigmoid blow-hole is at the anterior end of the head, slightly to the left side; the mouth is ventral behind the end of the snout, the lower jaw may be let down almost at right angles to the upper, and the gape is thus enormously wide; the throat, unlike that of the baleen whales, is also wide, sufficient it is said to admit a man's body; the pectoral limbs are short and broad; the dorsal fin is represented only by a low protuberance. The sperm whale feeds chiefly on cephalopods. The "schools" may consist of hundreds, led by two or three large bulls; the females often endanger their own safety in aiding their offspring to escape; the bulls sometimes fight desperately with one another, or with their persecutors, and are said to sink not only boats, but even whaling vessels. Apart from oil and spermaceti, the cachalots yield "ambergris," an intestinal concretion of strong odor, formerly used in medicine, now restricted to perfumery. The cachalot is not frequent on European coasts, but is said to have occurred in the Mediterranean, and has been occasionally stranded on British shores.

Within the same family as the sperm whale is the imperfectly known *Cogia breviceps*, a small whale about 10 feet in length, met with at various distant localities in the Southern Oceans, and also off the coast of Madras, and in the North Pacific; the bottlenose (*Hyperoödon rostratus*), regularly hunted in the North Atlantic, besides several other forms. Very remarkable are the fluviatile and estuarine *Platanistidæ*, the blind *Platanista* of the Ganges, Brahmaputra, and Indus, *Inia* in the Amazon, and *Pontoporia* in the estuary of the Rio de la Plata. The *Delphinidæ* are represented by numerous forms — *e. g.* the Arctic norwhal (*Monodon monoceros*), remarkable for the enormous single tusk of the male; the beluga (*Delphinapterus leucas*), a pure white Arctic whale occasionally coming as far S. as Scotland and the St. Lawrence; the common porpoise (*Phocæna communis*); the killer or grampus (*Orca gladiator*); the caaing whale (*Globicephalus melas*); the common dolphin (*Delphinus delphis*); and many others.

Whale

*Whale Fishery.*— This seems to have originated in ancient times and independently in many parts of the world. Indians, Eskimos, Japanese, Tartars, and Norsemen were among the early whale hunters. When the Atlantic right whale was still common, its pursuit was a recognized occupation of the seafaring folk of the Biscayan and Basque provinces, from the 10th to the 16th centuries. As whales became scarce in S. seas, the fishery removed N., and squabbles arose among the nations as to the various "grounds," which are now regarded as unrestrictedly international. The Dutch founded the settlement of Smeerenberg, in Spitzbergen, as a provisioning center for the whalers and a melting place for the whales; but by-and-by this was abandoned, for the whales were driven off and the fishery shifted to Greenland, whence the blubber was sent direct to Holland. In 1680 the Dutch had 266 ships and 14,000 sailors engaged in whaling, and for many years it was from Holland that the chief oil supply of Europe was drawn. Soon, however, a decline set in, and toward the end of the 18th century the Dutch fishery had almost ceased. From 1732 to 1824 the British whalers were stimulated and subsidized by a government bounty of so much per ton, yet in 1815, when the British whale fishery was in its most flourishing condition, only 164 ships were engaged in it. By 1828 the number had, however, fallen to 89 vessels, 49 of which were fitted out at Scotch ports. In that season 1,197 whales were captured, the result being 13,966 tons of oil and 802 tons of whalebone. At present Dundee and Peterhead are the chief centers of the British whaling industry, but the number of vessels employed by the two ports is not more than 30.

During the 18th century a new competitor had entered the field, and soon distanced all others. In New York and Delaware, New England, and California whaling became an important industry, and as the whales retreated from persecution they were followed as far as Newfoundland. About 1750 the distant fishery was prosecuted with vessels of as much as 130 tons. New Bedford, destined to become the metropolis of the American whale fishery, entered on the business about 1755. In 1765 Boston had 100 small vessels. Toward the last quarter of the 18th century the whalers became more adventurous, and voyaged to the Brazil Banks, Cape Verde Islands, West Indies, etc., but further progress was

stopped by the Revolutionary War, and many American whalemen sought fortune in Europe. The first whale ship that ventured into the Pacific was sent from England in 1787, and was manned by Nantucket men. Subsequently the coasts of Chile and Peru and of East Africa were visited. In 1839 the American whale fishery, having recovered from its temporary decline, boasted a fleet of 557 vessels. In 1846 the whaling fleet consisted of 678 ships and barques, 35 brigs, and 22 schooners, but soon after this date the fishery began to decline.

Nowadays a whaler is a ship of 300 to 500 tons, with four or more five-oar boats, with an entire company of not less than 35 men. There are hundreds of specialized appointments — *e. g.* windlasses for raising the blubber, boilers for "trying" or melting the blubber, tanks for storing the oil. The crew are usually shipped on a profit-sharing system. A whaleboat is 28 to 30 feet by 6, sharp at both ends, and with sloping sides. It is manned by "boat-header," boat-steerer, and four men. It carries a long line coiled in one or two tubs, and arranged to run in a convenient manner when the harpoon to whose end is it fixed has struck a whale. And besides the essentials — harpoon and line — there are numerous accoutrements — *e. g.* lances, bomb gun, and harpoon gun. From a distance of about three fathoms the boat-steerer throws his harpoon, or more than one; if it strikes, the oarsmen back water vigorously to escape the not infrequent blow of the whale's flukes. If the whale is fast, its behavior regulates the working of the boat; but whether the victim "runs," or sounds," or "brings to," the whalemen do their utmost to get as soon as possible within range of lance or gun.

*Economic.*— As is well known, whales are chiefly valuable on account of the oil yielded by the blubber and the whalebone or baleen. Spermaceti and ambergris have a subsidiary economic importance. As to the oil, which was formerly the most remunerative result of whaling, it must be remembered that the use of gas and other modern illuminants has reduced the necessity for having oil lamps, and that mineral and vegetable oils are now used for many purposes —*e. g.* "batching" jute, for which whale oil was once in great request. Still, however, the oil finds a ready sale, the sperm oil of Physeter having a distinct precedence over the train oil of the baleen whales.

It must be admitted that though great prizes are sometimes won by the whalers, the fishery is somewhat of a lottery. Apart from the dangers of shipwreck, exposure, and starvation, now happily diminished, the vessels may come home "clean," or without a single fish. It is recorded that a Peterhead whaler once captured in one season 44 whales, and returned with a cargo of oil and whalebone valued at over $30,000; and that the "Arctic" of Dundee, under Captain Adams, once brought home the produce of 37 whales, including about 18 tons of baleen. But such cases are rare, and, considering the diminished demand for whale oil, and the fact that whalebone is not more necessary to civilization than spermaceti or ambergris, it may be reasonably doubted whether the whale fishery, except as a safety-valve for the adventurous or as an opportunity for scientific research, warrants the persecution of the noblest animals which have their home in the sea.

**Whaleback,** the name of a form of steam vessel invented by Capt. Alexander McDougall, of West Superior, Wis., in 1874. In 1888 the first whaleback barge was built of 437 tons registry and 1,400 tons capacity. Her cost was $45,000 and in two years she netted nearly twice that amount for her owners. The name whaleback was suggested by the resemblance of the visible portions of the vessel, when afloat, to the back of a whale. Captain McDougall's idea was to build a vessel of steel with top sides and erections rounded in such form as would reduce the resistance to both wind and water to a minimum. The spoon bow is, also, one of the greatest features of the whaleback design, as it gives such an easy entrance; and, instead of cleaving the water, rides over it. The vessels are constructed after the ordinary model in the bottom, with double bottom for water ballast, but the frames are continuous from center line of keel to center line of deck, thus making the deck and sides much stronger than the deck and top sides of an ordinary vessel. The hatches are so arranged as to give back the full strength to the hull when the hatch plates are bolted on, a feature lacking in the ordinary type of vessel. A whaleback crossed the Atlantic in 1891. At the World's Fair in Chicago (1893), the "Christopher Columbus," a vessel of this type with a passenger capacity of 5,000 ran between the city and the Fair. A number of tow-barges and freight steamers have been built, some of which are in use on the Atlantic coast. It is also believed that this style of vessel is well adapted for warships.

**Whalebone,** a horny substance, occuring in long, thin plates, fringed at the edges, and acting as a strainer to detain the whale's food when the animal ejects the water which it has swallowed with the medusæ and small fry which constitute its food. The principal source of whalebone is the "right whale," so called, the *Balæna mysticetus* or *australis*. Some 300 of the plates are found in the mouth of an adult

whale, and vary from 10 to 15 feet in length. Being very flexible, strong, elastic, and light, whalebone is employed for many purposes, as for ribs to umbrellas and parasols, for stiffening ladies' corsets, etc. Also, and more properly, called baleen.

**Whalley, Edward,** an English regicide; born in England presumably about 1620. During the Revolution of 1642 he was a member of the Parliamentarian party, and commanded the force that defeated the cavalry of Sir Marmaduke Langdale at Naseby in 1645. Subsequently he was made custodian of King Charles at Hampton Court. He was a member of the court which condemned that monarch to death, and he also signed his death warrant. After the restoration of the Stuarts Whalley fled to America with his son-in-law, William Goffe. He died in Hadley, Mass., about 1678.

**Whale Louse** (*Cyamus ceti*, order *Læmodipoda*), a genus of small crustaceans, so named from living a parasitic life on whales and other cetaceans.

**Wharton, Anne Hollingsworth,** an American story-writer; born in Southampton Furnace, Pa., Dec. 15, 1845. She was a judge of the American Colonial Exhibit at the World's Columbian Exposition. Among her books are: "The Wharton Family" (1880); "Virgilia"; "St. Bartholomew's Eve"; "Colonial Days and Dames"; "Through Colonial Doorways"; "Martha Washington: A Biography"; "A Last Century Maid" (1895); "Salons Colonial and Republican" (1900); and "Heirlooms in Miniature."

**Wharton, Mrs. Edith Stevens,** an American author; born in New York in 1862; married Edward Wharton, of Boston, in 1885. She wrote: "The Greater Inclination" (1889); "The Touchstone" (1900); "Crucial Instances" (1901); "The Valley of Decision" (1902).

**Wharton, Francis,** an American jurist; born in Philadelphia, Pa., March 7, 1820; was graduated at Yale College in 1839, and admitted to the bar in 1843. From 1856 to 1863 he was Professor of Logic and Rhetoric in Kenyon College, O.; in 1863 was ordained in the Protestant Episcopal Church and became rector of St. Paul's in Brookline, Mass., and in 1866 became a professor in the Episcopal Divinity School at Cambridge, Mass. He also held the chair of international law in the Boston Law School. In 1885 he was appointed solicitor for the State Department. Under a resolution of Congress (1888) he was made editor of the Revolutionary diplomatic correspondence of the United States. He wrote extensively on legal and theological subjects. His best known work is a "Treatise on the Criminal Law of the United States" (1846), which is accepted as a standard. He wrote also: "Precedents of Indictments and Pleas"; a "Treatise on Medical Jurisprudence," "The Conflict of Laws" (1872); "The Law of Agency and Agents" (1876); "Commentary on the Law of Contracts" (1882); "Treatise on the Law of Evidence and Criminal Issues." He died in Washington, D. C., Feb. 21, 1889.

**Wharton, Philip, Duke of,** an English politician; born in December, 1698. Trained by his father in Whig Presbyterian principles, he broke that father's heart by marrying at the Fleet the daughter of Major-General Holmes (1715); next, leaving his bride, set out for Geneva with a French Huguenot for governor. Tutor and ward soon parted, the latter going to Avignon, where the Old Pretender conferred on him the title of Duke of Northumberland, and Mary of Modena lent him $10,000. This squandered at Paris, he went to Ireland, and sitting a minor in the House of Lords, so ably upheld the Hanoverian government as to earn for reward a real English dukedom, Jan. 20, 1718. His gratitude showed itself in non-resistance to the government's South Sea Bill (1721) and Bill of Pains and Penalties against Atterbury (1723), as also in his Opposition "True Briton" (74 numbers, 1723–1724), started to retrieve a fortune which from $80,000 a year had dwindled to $600 allowed by creditors' trustees. This venture failed, and in 1724 he quitted England never to return. From Vienna he went to Madrid, and there he professed himself a convert to Catholicism and open adherent of the House of Stuart. At Rome the Pretender invested him with the Order of the Garter, but from Rome his excesses procured him a courteous dismissal, and 1727 found him engaging with reckless bravado in the siege of Gibraltar, thus purchasing a Spanish colonelcy by the loss at home of peerage and estates. Madness and drunkenness drove him to Paris, Orleans, and back to Spain, where a foolish quarrel embroiling him with the Madrid court, he fell into melancholy and deep dejection. So on May 31, 1731, at a Bernardine convent in Catalonia, died he whose character Pope thus summed up—"Wharton, the scorn and wonder of our days."

**Wharton, Thomas Isaac,** an American journalist; born in Philadelphia, Aug. 1, 1859. He was an editorial writer on Philadelphia journals, and contributed largely to various periodicals. He published the novels "A Latter-Day Saint" and "Hannibal of New York"; and wrote the popular short story, "Bobbo." He died April 6, 1896.

**What-Cheer,** the watchword or shibboleth of the people of Rhode Island. It is derived from the fact that the Indians of that State thus greeted the founder of the colony, Roger Williams, as he and his companions

landed from a canoe on Sekonk river, near the site of the city of Providence.

**Whatcom,** a city and county-seat of Whatcom co., Wash.; on Bellingham Bay, and on the Northern Pacific, the Great Northern, and the Bellingham Bay and British Colonial railroads; 125 miles N. of Seattle. It is in a rich mineral, lumber, and agricultural section. Here are a State Normal School, waterworks, street railroad and electric light plants, National and private banks, and a daily and several weekly newspapers. The celebrated Cornwall coal mine is 4 miles from the city. A State road extends over the Cascade Mountains to the grazing lands, gold and silver mines, and the Columbia river. The assessed property valuation is $3,000,000. Pop. (1890) 4,059; (1900) 6,834.

**Whately, Richard,** an English clergyman; born in London, England, Feb. 1, 1787, son of the Rev. Joseph Whately. He received his education at a private school at Bristol, and at Oriel College, Oxford. He graduated B. A. in 1808, and in 1810 won the English essay prize. In 1819 he made his first appearance as an author by publishing his famous "Historic Doubts relative to Napoleon Bonaparte." In 1822 Whately was appointed Bampton lecturer at Oxford, and delivered eight lectures "On the Use and Abuse of Party Feeling in Matters of Religion." He held the living of Halesworth in Suffolk in 1822–1825, and was then appointed principal of St. Alban's Hall, Oxford. In the latter year he published "Essays on Some of the Peculiarities of the Christian Religion." A second series of essays "On Some Difficulties in the Writings of St. Paul and Other Parts of the New Testament," came out in 1828; and a third series, "The Errors of Romanism traced to their Origin in Human Nature," in 1830. In 1827 was published "The Elements of Logic," and the scarcely less popular "Elements of Rhetoric" in 1828. Both of these works were written originally for the "Encyclopædia Metropolitana." He occupied the chair of political economy at Oxford in 1830–1831, and afterward published "Introductory Lectures on Political Economy." In 1831 he was appointed Archbishop of Dublin, a position in which he did much for national education and other worthy objects in Ireland, including the foundation and endowment of a chair of political economy in Trinity College. He was called one of the founders of the "Broad Church" party; and was noted for his munificence. Besides the works already mentioned he wrote or edited many others. He died in Dublin, Oct. 8, 1863.

**Wheat,** the most valuable and, next to maize or Indian corn, the most productive of all the cereal grasses. The genus *Triticum* of which the species are popularly known either as wheat or wheat grass, are distinguished by a spike with many-flowered spikelets without stalks, and seated one on each notch of the rachis, their sides directed to the rachis, which is zigzag, and two glumes, of which the lower is either awned or awnless; the outer palea of each floret having at the top a notch, in the center of which is the terminal point, sometimes prolonged into an awn, or in some species with many florets tapering into an awn without a notch. The native country of the cultivated wheat has generally been supposed to be the central part of Asia; but the *Ægilops ovata*, a grass of the regions near the Mediterranean, and of Western Asia, becomes transformed by cultivation into wheat and may be regarded as the original form. Wheat is now the breadstuff of 12 European nations, and is extensively used in North America and to a considerable extent in India. It was no doubt widely grown in the prehistoric world. The Chinese cultivated it 2700 B. C. as a direct gift from heaven; the Egyptians attributed its origin to Isis, and the Greeks to Ceres. A classic account of the distribution of wheat over the primeval world shows that Ceres, having taught her favorite Triptolemus agriculture and the art of bread making, gave him her chariot, a celestial vehicle which he used in useful travels for the purpose of distributing corn to all nations. Ancient monuments show that the cultivation of wheat had been established in Egypt before the invasion of the shepherd kings, and there is evidence that more productive varieties of wheat have taken the place of one at least of the ancient sorts. Common wheat (*T. vulgare, æstivum,* or *sativum*) grows to a height generally of three or four feet, and has ears or spikes generally three or four inches in length; the spike four-cornered, the spikelets about four-flowered. Besides being classified as bearded and beardless the varieties in cultivation are distinguished according to the color of the grain, as white and red wheats. Some having the ears covered with a short soft down are known as woolly wheats. Innumerable varieties exist. Col. Le Coteur, of Jersey, cultivated 150 varieties. Mr. Darwin mentions a French gentleman who had collected 322 varieties, and and the great firm of French seed merchants, Vilmorin-Andrieux & Co., have cultivated about twice as many in their trial grounds near Paris. Henry L. de Vilmorin has described 68 varieties of best wheat, which he has classed into seven groups, though these groups can hardly be called distinct species, since he has crossbred three of them, and found the offspring fertile. Three small-grained varieties of common wheat were cultivated by the first lake-dwellers of Switzerland, and as well as by the less ancient lake-dwellers of Western

Wheat Breeding

Switzerland and of Italy, by the people of Hungary in the stone age, and by the Egyptians, on the evidence of a brick of a pyramid in which a grain was imbedded, and to which the date of 3359 B. C. has been assigned. The existence of names for wheat in the most ancient languages confirms this evidence of the antiquity of its culture in all the more temperate parts of Europe, Asia, and Africa. Many parts of the United States and British provinces and wide regions of South America are admirably adapted to its cultivation. Wheat of the finest quality is also produced in Australia. It is computed that in Queensland alone there are 50,000,000 acres of virgin soil suitable for the cultivation of this cereal. Large areas of Asia Minor and the Danubian provinces not yet utilized for that purpose could be made to add largely to the world's output of wheat. The value of wheat depends mainly on the quantity of fine flour which it yields; the best wheat yielding 76 to 80 per cent., sometimes even 86 per cent., of fine flour. The greater part of the husk of wheat is separated from the flour by the miller, and is known as bran. That portion of the bran which is more finely divided that the rest receives the name of sharps or pollards.

**Wheat Breeding.** A revolution in the production of wheat is promised — the beginnings of it have in fact been achieved — by the successful experiments made during the last 10 years at the Minnesota State Experiment Station, associated with the agricultural school of the University of Minnesota. The aim was to make new breeds of wheat. Both yield and quality are greatly increased.

The new wheats which are the product of breeding and selection combined, have been tested for every purpose. They are not only larger in yield than the old wheats and better able to withstand unfavorable weather and disease, but they are as rich in essential food qualities. During the summer of 1900 the experimental stage was passed and actual farm trials were made; for a farm trial is the ultimate test of a new wheat. Whatever favorable results may be shown in the experimental stages, the wheat must still stand the final practical test in the fields of the farmer. In the fields it has now proved its right to supplant the old, standard varieties. The concrete results are these: a toning up of the wheat harvest, not only of the region where the experiments are carried on, but of the entire wheat area of the world; the overthrowing of the argument of Sir W. Crooks, president of the British Association, that the supply of the wheat of the world would soon become inadequate for the needs of the world; a marked increase in the world's wealth, millions of dollars being added in a single season in only one section of the wheat-producing area of the world.

The work of wheat breeding began many years ago on the great Vilmorin estate in France. M. Henri Vilmorin, carried on extensive experiments in the creation of new breeds, more than a thousand new wheats having been tested by him. Ten years ago similar work was begun at the State institution in Minnesota, not only to create new breeds of wheat but to carry them forward through a series of years till enough wheat of a superior variety should be accumulated to enable the farmers to make the final test themselves. This work has been carried on at no expense to the farmer, for all the results are for the benefit of the public.

To create a new wheat the pollen from the flower of one wheat must be artificially transferred to the stigma of the flower of another wheat. Wheat is a self-fertilizing plant. Left to itself, it will reproduce itself throughout endless centuries. Great care is necessary in the work, and trained men are essential. As soon as the pollen is transferred — which is done about four o'clock in the morning at the hour when the wheat florets open — the head of wheat is encased in a tissue sack so that the work may not be interfered with by any pilfering insect or bird. Two of the best-known varieties are selected, one for the father, the other for the mother of the new race. When the harvest comes it may be that the new wheat has some of the poor, and few of the good characteristics of the parents; or the reverse may be the case. It is impossible to say in advance what the new wheat will be.

From the single head which results as the first harvest, only a handful of kernels is threshed out. This handful is of immense importance, for these kernels may become the source of a mighty race, destined not only to supplant the old wheats but to add enormously to the wealth of the world. But the last results are slowly won; for the first harvest is very meager and the second and even the third are small. But after a number of years enough wheat can be garnered to sow the twentieth of an acre; and then come tangible results. To breed a new wheat requires infinite pains and patience. It has taken 10 years to bring the new wheat varieties at the Minnesota Experiment Station to the farm test.

In the meantime hundreds of wheats have been proven valueless. Some were too heavy in the stalk, thus "lodging," as it is called, falling over in seasons of much moisture because of a too rank growth; some were particularly susceptible to the diseases of wheat; some were poor in the color of the kernel, while still others were deficient in yield or lacking in essential food elements. A successful new wheat must not only yield

a larger number of bushels per acre, the first and all-important requisite, but it must be hardy and it must be rich in food qualities.

Selection plays an important part as well as breeding. At every step only the best wheat kernels and wheat stalks are preserved; defectives are rejected. No effort is spared to give the new wheat the best possible start in life. In some ways the selection may be considered more important than the breeding itself. During these experiments nearly 500 wheats were thrown away as deficients. Out of the entire number bred, less than a dozen were retained. A number of those which were kept for future trials were especially prolific, registering as high as from 8 to 10 bushels per acre above the old wheats planted alongside of them and receiving the same treatment.

It seems fair to say that the increase of the new wheat over all old varieties will be at least two bushels per acre. In the three States of Minnesota, North Dakota and South Dakota, there are on an average about 15,000,000 acres of land planted to wheat. When the new wheat is in use over all this region, an increase of only two bushels per acre will make a crop at least 30,000,000 bushels larger than the old varieties would have yielded. At an average price of 75 cents per bushel, the increase in wealth in the region will be $22,500,000 a year.

The wheat known as Minnesota No. 163 has yielded as high as 42.7 bushels per acre, while none of the eight new wheats during the six years' trial has ever run behind 19.5 bushels. The average of each new wheat for a period of six consecutive years, from 1895 to 1900, inclusive, is in no case less than 27 bushels per acre, while the average of all the averages of the new wheats is 27.1 bushels per acre. The general average of the standard varieties in the region on the farms is from 13 to 15 bushels per acre, so that, while making due allowance for superior farming at the station, the allowance of an increase of two bushels per acre when the new wheat passes into complete sway in the N. W. wheat fields, seems far too low. On a number of farms of the higher type it has shown more than two bushels increase.

The tabular statement subjoined shows in condensed form what the eight best wheats have accomplished at the station. Each of these is given a number rather than a name, prefaced by the word Minnesota. Some of the eight give promise of yielding better results than have been achieved by Minnesota No. 163, the wheat now under test by the farmers. In the table the first three wheats are the old, standard varieties. The table shows results for a period of six years.

It does not seem too much to say that science has here achieved a notable triumph; for it has not only given to the world additional safeguards to one of the most important industries known to the race, but it has added materially to the world's wealth.

YIELD OF VARIOUS WHEATS OVER A PERIOD OF YEARS.

| Variety. | Minn. Number | 1895 Yield. | 1896 Yield. | 1897 Yield. | 1898 Yield. | 1899 Yield. | 1900 Yield. | Average. |
|---|---|---|---|---|---|---|---|---|
| Haynes' Blue Stem | 51 | 21.6 | 24.6 | 20.4 | 23.3 | 25.9 | 30.5 | 24.4 |
| Powers' Fife | 66 | 26.3 | 21.4 | 17.4 | 24.0 | 30.4 | 31.5 | 25.2 |
| Bolton's B. S. | 146 | 35.3 | 25.1 | 21.5 | 22.5 | 28.8 | 32.3 | 27.6 |
| Minnesota Number | 149 | 36.2 | 23.3 | 19.9 | 26.5 | 31.8 | 29.9 | 27.9 |
| " " | 155 | 32.3 | 23.3 | 20.8 | 26.8 | 32.0 | 29.0 | 27.4 |
| " " | 157 | 30.9 | 22.0 | 21.4 | 26.6 | 33.0 | 30.0 | 27.3 |
| " " | 163 | 42.7 | 23.0 | 19.9 | 25.0 | 30.3 | 34.3 | 29.2 |
| " " | 167 | 35.0 | 24.9 | 19.7 | 27.0 | 30.0 | 30.6 | 27.9 |
| " " | 169 | 37.8 | 25.0 | 24.3 | 26.3 | 28.8 | 30.9 | 28.8 |
| " " | 171 | 35.0 | 21.7 | 19.8 | 26.3 | 32.0 | 36.3 | 28.5 |
| " " | 181 | 34.5 | 22.2 | 19.5 | 26.5 | 25.6 | 39.6 | 28.0 |

**Wheat Industry.** Wheat is what the naturalist calls cereal grass, and belongs to the same family as oats, rye and other grain raised on slender stalks. Wheat, however, is considered the most valuable of these grasses, as it can be used in such a variety of ways for food, for even the stalk is of value. It is a native of the temperate zone, though it has been grown in tropical countries, but on high land where the temperature is lower than in other sections.

Because it is so hardy, many millions of acres are planted with the cereal, and it is raised by nearly every civilized nation. The fields in Russia alone cover about 30,000,000 acres, the French farms aggregate 17,000,000 acres, while the Australian fields cover from 5,000,000 to 6,000,000 acres. One of the greatest wheat-growing countries in the world is the Argentine republic, where about 8,000,000 acres are planted yearly. The United States and Russia lead the world in the cultivation of this staple, the acreage in this country ranging from 40,000,000 to 50,000,000 acres yearly.

Wheat Industry

When analyzed or separated into its various parts by the chemists, wheat is found to contain from 60 per cent. to 70 per cent. of starch, about 12 per cent. of albumen, about 1 per cent. of oil and traces of gum. The albumen consists largely of gluten. The farmers raise different varieties in this country, though the wheat generally cultivated grows on stalks from three to four feet in height, having ears or spikes from three to four inches in length. The bearded wheat is so called from the beard of hair which grows from the spike. Varieties of this wheat are raised in some parts of the country. The grains are of two colors, white and red, the red wheat being found more in the N. part of the United States and in Canada where the climate is colder. It is more vigorous than the white species, but the yield is not as abundant and the kernel or grain is smaller. White wheat forms the great crop of the farmer in the United States, and is depended on principally for the white or wheat bread we eat. As the grass will grow in a heavy clay or rich loamy soil, very large tracts of land, such as the broad prairies of the West, are especially adapted to it, and in Kansas, Nebraska, North and South Dakota, as well as Minnesota, can be found wheat farms, some of which are 10 and 15 miles in length. The highest grade raised in this country comes from Minnesota and Manitoba. This is why some of the largest flour mills in the world are situated in Minnesota, those in Minneapolis alone grinding 35,000 barrels in a day.

Wheat is known to the farmer as "winter" and "summer," the winter wheat being sown in the fall, and the summer varieties in the spring. It is only necessary to plow the surface of the field, making shallow trenches with a machine drawn by horses. Then the seed wheat can be dropped into the trenches, or drilled, as it is sometimes called, by hand or by machinery. It is covered over, and in a few weeks begins to spring above the ground in the form of a tender green shoot, the field resembling a plot of grass. With favorable weather it matures very rapidly, and just before it is ready to cut or harvest, presents a beautiful appearance, as the shoots are very graceful and of a rich color between green and gold. The old way of harvesting wheat was to cut it by hand with a scythe or sickle, rake it into bundles and bind them. Most of this work is now done by harvesters drawn by horses, and in some cases by steam engines. The harvester is furnished with knives and rakes, and not only cuts the grain and forms it into bundles, but actually ties them by machinery, so that the only work required to be done by hand is to place the bundles in shocks or stacks till they are threshed. These harvesters will do as much work in a day as 40 or 50 men, and are used almost exclusively on some of the great Western grain farms. Threshing is separating the kernel of the wheat from the stalk. In former days it was done by pounding the wheat with a loose piece of wood called a flail; but machinery has largely taken the place of this implement also, so that the stalk goes in one end of the thresher and comes out of the other in the form of straw, while the grain drops into a receptacle underneath to be placed in bags ready for the mill.

To prepare the wheat for food, the kernel is broken or crushed in various ways. In many parts of the world it is placed between heavy stones or burrs which have grooved surfaces. By moving one stone on the other the kernels are broken. Till a few years ago many of the flour mills in the United States ground the grain between millstones, but the modern mill is operated by what is known as the roller process, patterned after the machinery used largely in Hungary. In the large flour mills of today the wheat is first cleaned by being placed in a cylinder covered with wire cloth, where it is brushed by arms which revolve inside the cylinder. These remove the dust and other impurities from the surface of the kernels, which then are passed between pairs of rollers of different sizes. The surface of the rollers is lined or creased in such a way that the grain is broken into pieces ranging from the size of a pinhead to particles of sand, called "middlings," while some of it is converted into the flour of commerce. The flour is separated by machinery from the middlings, into cylinders also covered with wire cloth or silk gauze, while the middlings pass along a conveyor to be again crushed between the rollers. This process may be repeated six or seven times till the miller decides that all of the meat of the kernel which can be secured has been powdered. To separate the flour itself from the pieces of hull which cover the kernel of the grain, it is treated to a current of air, produced by rapidly revolving fans, and the impurities are thus blown from it. The product of the mill is usually sorted into three grades: the "patent," which is the first quality; the baker's flour, which is considered the second, and the bran or low grade. Out of 100 pounds, from 70 to 76 per cent. is the patent, 18 to 22 per cent. the second grade, while the lowest grade rarely averages over 8 per cent., which shows the efficiency of the machinery employed in the modern rolling mill, as it is termed.

When the Chinese made their bread or cake of wheat 3,000 years before the Christian era, they merely soaked the broken wheat in water, then heated it over a fire.

Wheat Industry

Real bread, as we know it, has been made during a comparatively short period, for unleavened bread was used almost entirely up to the beginning of the 19th century. The crackers we buy at the bakery are somewhat similar to the unleavened bread we read about in the Bible, for the children of Israel baked their broken grain after soaking it in water, using no substance to make it light or "raised." Leaven can be made by moistening flour and exposing it for six or eight days in the open air, when it begins to sour and absorb gas. Yeast is merely a substitute for this material, and is mixed with the dough in bread-making, to generate the gas which gives the bread its lightness. In modern bread-making two or three different kinds of flour may be blended by the baker. It is mixed with the yeast, water and a little salt, and kneaded into what is called a "sponge." By setting it in a warm place the yeast begins to ferment, turning the sugar contained in the substance into alcohol and carbonic acid gas. This gas becomes distributed through the sponge, and in trying to escape forms cells, swelling the mass. When the baker thinks the yeast has acted long enough, he adds more flour, water and salt to the sponge, letting it stand one or two hours, when it is ready to be cut into lumps or loaves for baking.

The oven in the modern bakery is heated to a temperature ranging from 450° to 575°, yet the interior of the loaf or sponge is really cooked more by boiling than by baking, as a loaf of good bread actually contains from 30 to 40 per cent. of water after the baking is completed. While the heat evaporates a part of the water, it partly boils the starch and gluten in the sponge, turning some of the starch on the outside into dextrine which gives the crisp, brown appearance to the crust.

In the small bakery the flour and other ingredients are mixed by hand or kneaded, but in the large establishments most of the work is done by machinery, the dough being mixed in large troughs by blades revolving on a shaft or spindle which is moved by steam, electric, or water power. It is kneaded in masses from which from 100 to 500 loaves at a time may be cut. Efforts have been made to invent machinery to slice the sponge into loaves, but thus far they have not been put to practical use. By the modern process it is estimated that 136 loaves of bread of the average size can be made from 100 pounds of flour.

What we call biscuits are merely composed of dough in which milk or eggs may be mixed with a small quantity of baking powder, which acts as the yeast or leaven. The baking powder produces the gas while the biscuits are being heated or cooked, and avoids the necessity of setting the dough to raise. What is known as "aerated bread," which is very popular in England and is used to a certain extent in this country, is merely the ordinary dough raised by carbonic acid gas being forced into it under pressure while the heat is being applied.

Wheat is especially valuable for making bread for the reason that it holds the gas much better than other grains. While rye, oats and corn, as well as other grains, can be baked for food, they do not hold the gas as well, and are more compact — "heavier" — as the cook calls it. Brown bread, sometimes called "Graham" bread, is made of the wheat combined with the bran, but the bran frequently irritates the coating of the stomach, though it contains much nourishment. The macaroni so popular in Southern Europe, is merely dough of the wheat flour pressed into strings or ropes by being drawn through apertures to give it shape, and then dried by heat from a fire or exposed to the sun. The manufacture of macaroni is one of the great industries in Italy, and in passing through the streets of Naples and some other cities, the traveler can see it spread on the porches of the houses, thousands of pounds being made in a year by a single family.

From the wheat kernel comes much of the starch used for cleaning purposes, though the largest quantity is manufactured from corn. In securing the starch from wheat, it may be fermented after being mixed with water, and in this way the gluten is separated. Another mode is to knead the flour into dough as in the preparation of bread, then to wash it in a sieve with water, the starch issuing from the dough in the form of a milky liquid, turning into the powder of commerce after the water has evaporated. Starch manufacture is carried on very extensively in Great Britain especially, probably the largest factories in the world using wheat as a base being located in Belfast, Ireland.

The straw which is thrown from the thresher can be made almost as valuable as the kernel of the wheat. It is used for filling ticks for bedding, is converted into wrapper paper and pasteboard, and is worn in various forms. The manufacturers of hats and millinery depend largely on the wheat stalk for their raw material. In this case, however, the stalk is pulled from the ground and carefully separated from the roots and spikes. Then it is slit by what might be called a four-bladed knife, which is pressed along the inside of the stalk, cutting it into even strips which are sorted into lengths, and then woven or plaited into convenient sizes for shaping into the hat or bonnet. The finest straw comes from the vicinity of Tuscany, in Italy, where the wheat has a reputation for its bright stalk. Here

it is grown more for the straw than for the kernel, and the work of plaiting gives employment to thousands of the women and children, most of the plaits being sent to the factories in Great Britain, some coming to the United States. The Chinese also carry on plaiting as an extensive industry, while much of the English material is obtained from Bedfordshire. Thus the few stalks which may grow on 10 or 12 feet of ground, and not be worth a dime in their ordinary condition, can be converted by the different processes of manufacturing into an article worth perhaps $20 or $25 when it is shaped, dyed and ornamented with flowers and ribbon, becoming what we call the bonnet.

The first wheat in the United States was planted in New England in 1602, and nine years later in Virginia, which was also the birthplace of Indian corn as we know it. In the period that has elapsed since that time, the wheat fields of this country have expanded, till the yield in 1860 was 260,146,000 bushels. Vast as was this quantity, it had increased till the harvest of 1898 amounted to 530,149,168 bushels — more than double the yield 40 years ago. In 1907 the United States farmers raised more wheat than those of any other country in the world—664,602,000 bushels. The Asiatic and European fields of Russia yielded 569,484,000, while France came next with 310,526,000. When the crop fails in the Old World, the United States is largely depended on to supply the deficiency. This is why wheat forms one of the principal exports of this country. In 1892 we sent abroad 157,280,351 bushels, and in 1897, 146,623,250 bushels; the lesser quantity being due partly to crop failures, though the exports of wheat alone have not been less than 50,000,000 bushels within the last five years. The value of the wheat sent to other countries in a single year has been as much as $161,399,132. The price of the cereal has, of course, varied according to the demand, it having a wide range. In 1899 it averaged between 64 and 80 cents a bushel, and in 1901 the range was between 63 and 77. In the calendar year 1910 the United States produced the enormous total of 695,443 bushels (winter and spring), valued at $621,443,000.

**Wheat Fly,** *Cecidomyia tritici,* a yellow and orange-colored two-winged fly, about a tenth of an inch long, with black eyes, the female of which deposits her eggs in the heart of the wheat blossom.

**Wheatley, Henry Benjamin,** an English philologist; born in Chelsea, London, England, May 2, 1838. He was an official of various London literary and other societies. Besides editing a number of works, he wrote: "Anagrams" (1862); "Round About Piccadilly and Pall Mall" (1870); "Samuel Pepys and the World he Lived In" (1880); "Decorative Art" (1884); "How to Form a Library" (1886); "How to Catalogue a Library" (1887); "Literary Blunders" (1893); etc.

**Wheat Moth,** the *Anacampsis cerealella,* a moth of the family *Tineidæ,* which expands half an inch, and is pale cinnamon-brown above, with a satin luster; hind wings lead color; the antennæ are thread-like, and consist of numerous beaded joints, and two tapering feelers are turned over the head. It lays from 60 to 90 eggs in clusters of about 20 on a single kernel of grain. In 4 to 6 days these eggs produce little worm-like caterpillars not thicker than a hair. Each burrows in a single kernel, and devours the mealy substance, and the work of destruction goes on so unseen, that it is only detected by the softness of the grain or the loss of its weight. When fully grown, the Angoumois caterpillar is not more than one-fifth of an inch long, white, with brownish head, six small jointed legs, and 10 extremely small prop legs. It goes into the chrysalis state within the kernel. Before this it has gnawed a hole nearly through by which to escape when it has finished its transformations. The insects of the summer brood come to the full larva growth in about three weeks, remain for a time in the chrysalis state, and in autumn they appear in the winged form, and may be found in the evening in great numbers laying their eggs upon stored grain. The moth worms of the second brood remain in the grain through the winter, change into winged moths in the summer, and lay their eggs on the ears of the growing grain.

**Wheaton, Frank,** an American military officer; born in Providence, R. I., May 8, 1833; was graduated at Brown University; entered the army as lieutenant in the 1st United States Cavalry in 1855, and until the outbreak of the Civil War was chiefly engaged in campaigns against the Indians in Nebraska, Missouri, and Kansas; was promoted captain in March, 1861, and colonel, July 21, 1861; and was appointed a Brigadier-General of volunteers in November, 1862. He served with the Army of the Potomac throughout the Civil War, taking part in the battle of Gettysburg, the Shenandoah Valley campaign, and in other important movements; was promoted Brigadier-General, U. S. A., in 1892, and Major-General and was retired in 1897. He died June 18, 1903.

**Wheaton, Henry,** an American jurist; born in Providence, R. I., Nov. 27, 1785; was graduated at Brown University, 1802; practised law in New York, 1812, and edited the "National Advocate." He was a reporter of the United States Supreme Court in 1816–1827, and then became chargé d'affaires to Denmark (1827–1835), and in 1835–1846 minister to Berlin. His chief

writings are: "Digest of Maritime Law" (1815); "Life of William Pinckney" (1826); "Reports of Cases in the Supreme Court" (12 vols. 1827); "History of the Northmen" (1831); "Elements of International Law" (1836); "History of the Law of Nations" (1841). He died in Dorchester, Mass., March 11, 1848.

**Wheaton, Loyd,** an American soldier; born in Fairfield, Mich., July 15, 1838. He served in the Federal army through the Civil War, rising from the rank of sergeant to that of colonel. On July 1, 1866, he was made captain in the 34th U. S. Infantry, and for some years he was engaged in frontier duty. In May, 1898, during the Spanish-American War, he became brigadier-general of volunteers and served in Cuba. Early in 1899 he was sent to the Philippines, where he performed conspicuous services, and in 1900 he was made major-general of volunteers. In 1901 he was promoted brigadier-general and major-general in the regular army, and in 1902 he was retired from the service.

**Wheaton College,** a coeducational institution in Wheaton, Ill.; founded in 1860 under the auspices of the Congregational Church; has grounds and buildings valued at over $180,000; endowment exceeding $95,000; scientific apparatus, etc., $12,000; volumes in the library, about 6,000; average number of faculty, 23; average student attendance, 250; graduates, over 400.

**Wheat Starch,** the starch or flour of wheat, frequently used in the adulteration of mustard, pepper, etc. It can be readily identified by the microscope, the larger granules being round and slightly flattened on one side, the smaller ones, when examined by a high power, being distinctly angular. Each granule has a hilum, or central spot, and many of the larger ones exhibit faintly marked concentric rings.

**Wheatstone, Sir Charles,** an English physicist and inventor; born in Gloucester, England, in 1802. Before he was of age he commenced business for himself in London as a maker of musical instruments, and in 1823 attracted the attention of men of science by the publication of a paper entled "New Experiments on Sound." This was followed by a number of other papers, some of them describing inventions of his own, all of which are remarkable for their ingenuity and delicacy of mechanical construction. Among his more familiar inventions are the stereoscope and concertina. In 1834 Wheatstone was appointed Professor of Experimental Philosophy in King's College, London, but he seldom lectured. In 1836 he exhibited at King's College experiments showing the velocity of electricity, which suggested to him the idea of applying his apparatus to telegraphing, and in 1837, in conjunction with William F. Cooke, he took out the first English patent for the electric telegraph. An official commission decided in 1841 that the practical application of the telegraph was due to Wheatstone's researches. He was a fellow of the Royal Society from the year 1836, and in 1868 he was knighted. He was the author of numerous papers, chiefly contributed to the "Philosophical Magazine" and the "Journal of the Royal Institution." He died in Paris, Oct. 19, 1875.

**Wheatstone's Bridge,** one of the best known forms of the electrical bridge or balance for testing electrical resistance.

**Wheel,** a circular frame or solid disk turning on an axis. The essential feature of a wheel is rotation, partial or entire. Its motion may be intermittent, oscillatory, or continuous. Its form may be circular or otherwise; its contour regular or irregular. Its functions may be to transmit motion or to modify it. Its application may necessitate cogs of a given form, or it may be smooth, its surface being free from contact with other portions of the machine. It may be hollow, for the conveyance or measurement of fluids; or it may be the means of propulsion of fluids; or conversely it may be propelled by them. It may form a support, and, by rotation, be made effective in assisting transportation. As used for vehicles, the wheel has a wooden or cast-iron hub (nave), wrought iron tire, and wrought iron or wooden spokes. The felly has holes flaring to the outside, so as to hold the ends of the spokes, which have heads to fit the openings. The inner ends of the spokes pass through the outer rim of the hub, and when of iron are secured by nuts. The insertion of the spokes in circles near the ends of the hubs gives them an extended base or bearing, and strengthens the wheel against lateral strain. Wheels receive different names according to the purpose for which they are used; as, balance wheel, cog wheel, crown wheel, fly wheel, paddle wheel, pinion wheel, scrape wheel, tread wheel, turbine, etc.

Also an apparatus, machine, instrument, or other object having a wheel-like shape, or the essential feature of which is a wheel; as (1) The revolving disk used by potters in modeling; a potter's wheel. (2) An instrument of torture formerly used for criminals of the most atrocious class. In some places it consisted of a carriage wheel, on which the criminal was placed with his face upward, and his legs and arms extended along the spokes. On the wheel being moved round, the executioner broke the victim's limbs by successive blows with a hammer or iron bar, and after a more or less protracted interval put an end to his sufferings by two or three severe blows, called *coups*

*de grâce* (mercy strokes) on the chest or stomach, or by strangling him. In Germany its use lingered down to the commencement of the 19th century.

Wheel and axle, one of the mechanical powers, a modification of the lever. Its most simple form is a cylindrical axle, on which a concentric wheel is firmly fastened, the whole being suspended horizontally. When this power is employed to raise heavy weights, the weight is attached to a rope wound round the axle, and the power applied to a rope placed in the grooved rim of the wheel, or to a handle fixed at right angles to the rim of the wheel, for which an ordinary winch may be substituted. This machine is a lever, the extremities of which are not points as in the normal form, but the circumference of the circles (the wheel and the axle). Hence the power and the weight are not attached to particular points in these circumferences, but to cords wound round them; and the imaginary simple lever (formed by joining the points where the cords become tangents to the circles) remains unaltered in position and magnitude. Since the circumferences of circles are proportional to their radii, the conditions of equilibrium are that P : W : : circumference of the axle : the circumference of the wheel (or, if a winch is employed, the circumference of the revolution described by the power).

To break upon the wheel, to subject to the punishment described above.

To break a fly (butterfly, etc.) on the wheel: To subject to a punishment out of all proportion to the gravity of the offense and importance of the offender, or to employ great means or exertions for trifling ends.

To put one's shoulder to the wheel; to lend one's help to an undertaking.

**Wheeler, Andrew Carpenter,** an American journalist and author; born in New York, June 4, 1835. He became a reporter on the New York "Times," and later was connected with the Milwaukee "Sentinel." During the Civil War he was correspondent for several papers. In 1865 he became connected with the New York "Leader" and "World," writing dramatic criticisms, etc., under the pseudonym of "Nym Crinkle," under which he also published: "The Chronicles of Milwaukee" (1861); "The Twins," a play, an adaptation of Dickens' "Tale of Two Cities" (1862); "The Primrose Path of Dalliance" (1902); etc. As "J. P. Mowbray" he wrote: "A Journey to Nature" (1901); "The Making of a Country Home" (1902); "Tangled Up in Beulah" (1902); and "The Conquering of Kate" (1903). He died in Monsey, N. Y., March 10, 1903.

**Wheeler, Benjamin Ide,** an American educator; born in Randolph, Mass., July 15, 1854; was graduated at Brown University in 1875; became professor of comparative philology at Cornell University in 1886 and of Greek in 1888; accepted the professorship of Greek in the American School of Classical Studies at Athens in 1896; and was made president of the University of California in 1899. His works include: "The Greek Noun-Accent" (1885); "Analogy in Language" (1887); "Introduction to the History of Language," joint author (1890); "Organization of Higher Education in the United States" (1896); "Life of Alexander the Great" (1900); etc. He was editor of the department of philology in "Johnson's Universal Cyclopædia" and of Macmillan's "Dictionary of Philosophy and Psychology."

**Wheeler, Crosby Howard,** an American missionary; born in Hampden, Me., Sept. 8, 1823; was graduated at Bowdoin College in 1847, and at Bangor Theological Seminary in 1851; went to Smyrna as a missionary in 1857. He was the founder and first president of Euphrates College in Harpoot. In 1896 his house was destroyed during the Armenian massacres in Harpoot and he was compelled to leave the city and return to the United States. His writings comprise: "Little Children in Eden"; "Letters from Eden"; "Ten Years on the Euphrates"; "Odds and Ends." He died in Auburndale, Mass., Oct. 11, 1896.

**Wheeler, Joseph,** an American military officer; born in Augusta, Ga., Sept. 10, 1836; was graduated at the United States Military Academy in 1859; served in the cavalry till the outbreak of the Civil War, when he entered the Confederate army, in which, after brilliant services, he became Major-General in January, 1863. He won distinction during the conflict as a daring raider. On Oct. 2, 1863, he crossed the Tennessee river and led 4,000 mounted men up the Sequatchie valley, where he burned a Union supply train of nearly 1,000 wagons; and was afterward attacked and forced to withdraw by Col. E. M. McCook. He then moved to McMinnville, where he destroyed another supply train and captured about 600 men. Gen. George Crook attacked him at Farmington, capturing 200 of his men, four guns, and 1,000 small arms. Wheeler then crossed the Tennessee, having taken property of an estimated value of $3,000,000, but with a loss of 2,000 men. In July, 1864, he was ordered with 8,000 men to harass General Sherman's rear. In August he moved against Sherman's supply depot at Allatoona, but was repulsed. Later he made a dash into East Tennessee and threatened McMinnville, Murfreesboro, and Lebanon, but was driven into Northern Alabama. After the war he entered the law profession; held a seat in Congress in 1881–1899; and was made Major-General of volunteers in May, 1898. During the Santiago campaign in Cuba he commanded

the Cavalry Division; participated in the battles of Las Guasimas and San Juan Hill; was appointed senior member of the commission to make arrangements for the surrender of the Spanish army; served in the

JOSEPH WHEELER.

Philippines from August, 1899, to January, 1900; was appointed a Brigadier-General, U. S. A., June 16, 1900, and was retired on Sept. 10, following. He died in Brooklyn, N. Y., Jan. 25, 1906.

**Wheeler, Nathaniel,** an American inventor; born in Watertown, Conn., Sept. 7, 1820; early engaged in the manufacture of carriages, but about 1848 joined Allan B. Wilson in manufacturing sewing machines. In 1852, on the establishment of the Wheeler & Wilson Manufacturing Company, he became its president, and by his practical knowledge of machinery and ability as an organizer soon built up the largest sewing machine factory in the world. Subsequently he served for six sessions in the Senate and House of the Connecticut legislature; invented and patented various improvements in sewing machines, railway cars, heating and ventilating apparatus, and wood finishing processes; was one of the commissioners for the building of the Connecticut State Capitol; and was a director of the New York, New Haven and Hartford Railroad Company. He died in Bridgeport, Conn., Dec. 31, 1893.

**Wheeler, William Adolphus,** an American lexicographer; born in Leicester, Mass., Nov. 14, 1833. He was assistant superintendent of the Boston Public Library in 1867. Besides assisting in the composition of "Worcester's Dictionary" and of the new illustrated edition of "Webster's Dictionary" (1864), and editing Hole's "Brief Biographical Dictionary" (1866) and a "Dickens Dictionary" (1873), he wrote "Dictionary of the Noted Names of Fiction" (1865); "Who Wrote It?" an index to anonymous literature, left unfinished by him, but completed by Charles G. Wheeler (1881); and "Familiar Allusions" (1882); left unfinished. He died in Roxbury, Mass., Oct. 28, 1874.

**Wheeler, William Almon,** an American statesman; born in Malone, N. Y., June 30, 1819. He was admitted to the bar in 1845; in 1851 he became a banker and was also connected with the management of railroads. He was a member and president *pro tem.* of the State senate, 1858-59; and was elected to Congress in 1860, serving only one term; was president of the State Constitutional Convention in 1867; served in Congress from 1869 to 1877 and was chairman of several of the most important House committees. In 1875-76 he promoted peace between the warring political factions in Louisiana through the measure known as the "Wheeler Compromise." In 1876 he was nominated for vice-president by the Republican party and was elected. He died in Malone, June 4, 1887.

**Wheelera,** a genus of *Leguminosæ,* consisting of three species. *B. ebenus* (the Jamaica or West Indian ebony tree) is a small tree, the wood of which is very hard and ponderous, sinking in water. It takes a fine polish, and is used for making various small wares, but has no affinity with the true ebony. It is also used by tanners and dyers under the name of green ebony.

**Wheeling,** a city and county-seat of Ohio co., W. V.; on the Ohio river, and on the Wheeling and Lake Erie, the Pittsburg, Cincinnati, Chicago, and St. Louis, the Ohio River, the Cleveland, Lorain, and Wheeling, and the Baltimore and Ohio railroads; 65 miles S. W. of Pittsburg, Pa. Part of the city is on an island in the river, connected with the main part by bridges. Here are a United States government building, court house, public library, Masonic and Odd Fellows' Halls, Wheeling and city hospitals, waterworks, street railroad and electric light plants, National, State, and savings banks, and a number of daily, weekly, and monthly periodicals. According to the census report of 1900 Wheeling had 406 manufacturing establishments with a combined capital of $13,224,577; employing 7,219 persons; paying $3,096,730 in wages and $9,076,978 for materials, and having a combined output valued at $16,747,544. Manufacturing is greatly promoted by the natural gas and bituminous coal found abundantly in the vicinity. The principal plants include steel and iron works, blast furnaces, glass factories, tobacco and cigar factories, foundries, boiler works, stove works, breweries, ice factory, machine shops, brass foundry, planing mills, etc. There are large shipments of coal and manufactured products by regular steamboat lines on the Ohio. The assessed property valuation exceeds $23,800,000, and the total bonded debt is

about $479,000. Wheeling was settled in 1769, and was the scene of battles with the British and Indians during the Revolutionary War. In 1863–1870, and in 1875–1885 it was the State capital. Pop. (1890) 34,522; (1900) 38,878; (1910) 41,641.

**Wheel Window,** in Gothic architecture, a circular window with radiating mullions resembling the spokes of a wheel.

**Wheel Purchase,** a simple contrivance for moving a wheeled carriage with increased power. It is formed by hooking a drag-rope to the tire of a wheel as near the ground as possible, carrying the running end up over the tire, and stretching it out so as to form a tangent to the wheel; when the rope is hauled on, the carriage advances. The power gained is in proportion to the diameter of the wheel.

**Wheelwork,** any combination of wheels for transmitting or regulating motion. The essential element in all such combinations is of course the wheel, which is simply a form of lever so contrived that the power can be applied continuously and uniformly. The use of wheels to facilitate locomotion dates from a very early period in the history of civilization, as is evidenced by the frequent references to them in the oldest known literature, the Indian "Vedas"; and the carriage or chariot was probably a gradual development from the cylindrical tree trunk placed as a roller beneath a load. In the action of a roller we recognize a particular case of what is known in the kinematics of machinery as motion by rolling contact, the general principle of which is that the points of contact of the surfaces of the two moving pieces are at the instant of contact moving in the same direction with the same velocities. Hence the linear velocity of a smooth rack in rolling contact with a roller rotating round a fixed axis is equal to the product of the angular velocity of the roller into the distance of the contact points from the center of rotation; and this is always the measure of the relative velocity of the rack and roller, whatever the apparent velocity of either may be; whether, as in a carriage wheel, the rack is fixed and the roller moves, or, as in translation by means of movable rollers, both rack and roller move. In the latter case there are nearly two smooth racks, the road and the object moved, and the object evidently progresses at twice the rate of the intermediate roller.

An important case of rolling contact is that of two wheels or rotating pieces. If their axes are fixed, the kinematical condition of rolling contact between these wheels requires that their angular velocities are inversely as their radii. The ratio between these angular velocities is called the velocity ratio, and indicates the speed with which the axis of the one wheel should rotate for a given speed of the axis of the other. In circular cylindrical wheels, by which motion is transmitted between parallel shafts, the wheels rotate in the same plane, and the velocity ratio is constant. If both rolling surfaces are convex, the case is one of outside gearing, and the wheels rotate in opposite directions; if one surface is concave, the case is one of inside gearing, the one wheel rolling inside the other, and both rotating in the same direction. To transmit a constant velocity-ratio between shafts which intersect, the rolling surfaces must be portions of right cones with their vertices at the point of intersection. If the shafts are not parallel and do not interesect, the surfaces must be frustra of hyperboloids of revolution, which touch along a common generating line. With smooth rollers, however, it is practically difficult to transmit rapid motions on account of the slipping of the surfaces in contact. The friction of contact may be increased by cutting circumferential wedge-shaped grooves in the rollers, so adjusted that the projections on the one fit into the recesses of the other, as in what is known as frictional gearing. Not even by this means, however, is slipping altogether prevented.

The most usual method of communicating motion between two wheels or between a wheel and a rack, so as to preserve an absolutely constant velocity ratio, is by means of teeth. These consist of a series of ridges alternating with hollows or spaces, set nearly parallel to the lines of contact of the imaginary toothless surfaces which would transmit the same velocity ratio as the toothed wheels do. These imaginary rolling surfaces are called the pitch surfaces; and it is with reference to them that a wheel is first designed and the form of the teeth deduced. According to the form of the pitch surfaces, wheels are classified as spur wheels, with cylindrical pitch surfaces; bevel wheels, with conical pitch surfaces; and skew bevel wheels, with hyperboloidal pitch surfaces. The pitch line is the section of the pitch surface with a surface perpendicular to it and the axis of rotation. This orthogonal surface is a plane perpendicular to the axis in spur wheels, a sphere with center at the apex of the conical pitch surfaces in bevel wheels, and an ellipsoid of revolution confocal with the hyperboloidal pitch surfaces in skew bevel wheels. In toothed wheels the pitch is the distance, measured along the pitch line, from the front of one tooth to the front of the next. For wheels which rotate continuously, the pitch must be an aliquot part of the circumference; and in order that a pair of wheels may work together the pitch must be the same in each. The velocity ratio of such wheels is then given as the ratio of the number of teeth in the one to the number of teeth in the other.

The dynamics of toothed gearing is that the teeth of the one wheel called the driver push against those of the other or follower, and during the action sliding takes place between the pairs of teeth in contact in a direction across their lines of contact. Here is what is called sliding contact, the general principle of which is that the components, along the common normal to the surfaces in sliding contact of the velocities of the points of contact are equal; and for theoretically perfect gearing this normal point at any instant should pass through the line of contact of the imaginary pitch surfaces of the wheels. A glance at the existing conditions of wheels in toothed gearing will show that the relative sliding motion of any two teeth in contact is such that the roots of the teeth approach with constantly-diminishing velocity, till for an instant they are stationary relatively to each, after which they recede with constantly-increasing velocity till they are beyond each other's influence. At this instant, when the relative sliding motion is changed from approach to recess, the point of contact of the teeth should be coincident with the pitch point or point of contact of the pitch lines. Hence the path of the point of contact of the teeth passes through the pitch point, and is divided by it into two portions, known as the path of approach and the path of recess; and in general the length of these paths must be so adjusted that two pairs of teeth at least shall be in contact at any instant, though in certain cases this is not possible.

Now the relative motion of any two wheels is equivalent to the rolling of the one wheel upon the other fixed, the instantaneous axis of rotation passing through the pitch point. Hence, in order that the teeth may remain continuously in contact, the form of the tooth of the fixed wheel should be the envelope of the successive positions of the tooth of the rolling wheel. Given the form of tooth of one wheel, then it is a comparatively simple geometrical problem to find the proper form of the tooth of another wheel to gear with it. Only certain forms of teeth, however, are practically realizable as wheel teeth, those forms being avoided which would make the complementary teeth entirely concave. It is impossible here to enter into a discussion of the best forms of teeth for practical ends; for an account of these, the reader is referred to the standard treatises on wheels and gearing.

For uniform working, it is evident that the teeth of the wheels in gearing should be equal and similar to one another; and to preserve this uniformity the more effectually, each given tooth in one wheel should work with as many different teeth in the other as possible. From this point of view, then, the numbers of teeth on the pair of wheels should be either prime to each other, or such as to have their greatest common measure as small as possible. The former condition is satisfied by a pair of wheels, the numbers of teeth on which are the numbers which express in its lowest terms the velocity ratio to be transmitted by the gearing. Should the velocity ratio be expressible by the quotient of two numbers, one of which at least is smaller than the minimum number of teeth realizable in practice, it becomes necessary to take equal multiples of these numbers as the numbers of teeth to be employed; and then, if the exactness of the velocity ratio is not of paramount importance, the evil of frequent contact between the pairs of teeth is avoided by giving an additional tooth, called a hunting cog, to the larger of the two wheels. If the velocity ratio exceeds 6, it is usually more advantageous to employ a train of wheels, which consists of more than two axis, each having on it two wheels, one of which acts as follower to the driving wheel on the preceding axis, and the other as driver to a wheel on the succeeding axis. The last variety of wheel is that included under the name banded or belted wheels. Here rotation is transmitted from one wheel to another at a little distance from it by connecting them with an endless band or belt, tightened so as to cause sufficient friction to make the belt adhere to the surface of the wheel with which it is in contact. Necessarily, of course, there is slipping, especially at great speeds, so that the velocity ratio transmitted cannot with certainty be calculated. In the ease and comparative silence with which they work, in the facility they offer for transmitting motion between wheels at some distance apart, and in the readiness with which by their means the motion may be reversed, banded wheels have over toothed wheels certain advantages which commend them for various purposes.

**Wheelwright, John,** an English-American clergyman, classmate of Oliver Cromwell at Cambridge University; born in Lancashire, England, about 1592; was suspended for non-conformity and came to Massachusetts in 1636. A brother-in-law of Anne Hutchinson, and defender of her religious opinions, he was banished from Massachusetts for seditious preaching, and founded Exeter on the Squamscott. He published, answering Thomas Welde, "Mercurius Americanus; or, Observations on a Paper entitled Of the Rise, Reign, and Ruin of the Familists, Libertines, etc., in New England" (1654); and a "Vindication" (1654). He died in Salisbury, N. H., Nov. 15, 1679.

**Wheelwright, John Tyler,** an American author; born in Roxbury, Mass., Feb. 26, 1856; was graduated at Harvard College in 1876; admitted to the bar in 1879; filled various public offices. He wrote: "New

Chance Acquaintance" (1880); "Rollo's Journey to Cambridge" (1880, with F. J. Stimson); "The King's Men" (1882, with F. J. Stimson, John Boyle O'Reilly, and Robert Grant); "A Child of the Century" (1887); "A Bad Penny" (1895).

**Whelk,** a popular name for a number of marine gasteropods, and especially applied to species of *Buccinum* common on the coasts

EGG OF COMMON WHELK.

of Northern seas. *B. undatum*, the common whelk, is often dredged for bait or as food for the poor. It occurs from low water to a depth of about 140 fathoms, and burrows in the sand for bivalves, such as *Mya*, on which it feeds. Its shell is sometimes three inches long, is grayish or brownish-white in color, and has a few ridged whorls, a wide aperture, and a short notch or canal for the respiratory siphon. The animal has a strong radula with which it can bore through shells, a markedly protrusible mouth, a long protrusible siphon through which water enters the gill chamber, and a plate-like horny operculum borne by the foot. The notch at the mouth of the shell, in which the siphon lies, is characteristic of most carnivorous gasteropods. The egg capsules, which are aggregated in balls, are often seen attached to the rocks or drifted on the sand. Each capsule contains a large number of eggs, but only a few of the embryos survive, as the result, it is said, of juvenile cannibalism. In Scotland B. *undatum* is often called the buckie, but the "roaring buckie" is *Fusus antiquus*, a related form, which has a much longer siphon canal. The name "dog whelk," or "dog periwinkle," is given to *Purpura lapillus*, a small form very common among the rocks and very destructive to mussel beds. It secretes a white fluid, which on exposure to air becomes a brilliant blue. Its egg capsules are also common on the rocks, and look like little vases standing erect in clusters. Another common "dog whelk" is *Nassa-reticulata*, abundant on the low water rocks. All these must be distinguished from the most edible whelk — the periwinkle (*Littorina littorea*), a vegetarian gasteropod not nearly related to the above. Whelk is also an old name for acne.

**Wherry,** a light, shallow boat, seated for passengers, and plying on rivers; also a light, half-decked fishing vessel, used in different parts of Great Britain and Ireland.

**Wherry, William M.,** an American military officer; born in St. Louis, Mo., Sept. 13, 1836; was educated at the University of Missouri and studied law; served through the Civil War; was aide to Gen. John M. Schofield in 1862–1866; and was present at the battles of Wilson's Creek, Dallas, Kenesaw Mountain, Atlanta, Jonesboro, Nashville, etc., and also at the capitulation of Wilmington and Kinston, and at the surrender of Gen. J. E. Johnston. He afterward served on frontier duty and won distinction in actions against the Indians. When the war with Spain began he accompanied the army of invasion to Cuba and took part in the battle of San Juan Hill, and in the capture of Santiago. He was promoted Brigadier-General, U. S. A., Jan. 7, 1899, and was retired the same month. His publications include "Death of General Lyon"; "Battles and Leaders of the Civil War"; "Lyon's Campaign in Missouri"; etc.

**Whetstone,** a piece of stone, usually a rectangular slab, used for sharpening cutlery or tools. Scythe stones are bellied, and taper toward the ends. Many varieties of stone, especially of the slaty kinds, are more or less perfectly adapted for the purpose. Some, however, are peculiarly suited for imparting a fine edge to tools, command a high price, and are generally used in the workshop as oilstones. In petrology, a siliceous clay-slate, compact and of homogeneous texture; used for sharpening edge-tools; called also whetslate and whetstone slate. To give the whetstone, To deserve the whetstone, old phrases, in which the whetstone is associated with lying, and regarded as the proper premium for accomplishment in that art.

**Whewell** (hū′ĕl), **William,** an English philosopher; born in Lancaster, England, May 24, 1794; was graduated at Trinity College, Cambridge, in 1816; became fellow and tutor of his college; in 1828 was elected Professor of Mineralogy. In 1832 he resigned this chair for that of moral philosophy, which he held till 1855, when he became vice-chancellor of the university. In 1841 he was nominated to the mastership of Trinity, and in this position he labored successfully to obtain for the natural and moral sciences a better recognized position among the studies of the university. He became fellow of the Royal Society in 1820, and was one of the first members of the British Association, of which he was president in 1841. Among Whewell's multifarious writings may be

mentioned the Bridgewater treatise, "Astronomy and General Physics, considered with reference to Natural Theology" (1833); "History of the Inductive Sciences" (1837); "Philosophy of the Inductive Sciences" (1840); "History of Scientific Ideas; Elements of Morality, including Polity (1845); "On Liberal Education in General; Lectures on the History of Moral Philosophy in England" (1852); "Platonic Dialogues" (1859–1861); "Lectures on Political Economy" (1863). He died in Cambridge, March 5, 1866.

**Whewellite** (after the late Prof. Whewell, of Cambridge), a rare monoclinic mineral occurring in well-defined, mostly twinned crystals on calcite, of unknown locality, though suggested by Quenstedt, from Hungary; hardness, 2.5–2.75; luster, vitreous to sub-resinous; brittle; fracture, conchoidal. Composition, an oxalate of lime.

**Whey,** the portion of milk which separates as a thin, greenish, clouded liquid, when by the addition of rennet, as in cheese-making, or other acid substance, the milk curdles and the casein portion takes the form of curd. The whey carries with it the greater part of the milk sugar and some portion of nitrogenous matter in the form of albumen and lacto-protein. By boiling the whey the greater part of the latter constituents can be separated as a nutritive thick white scum which rises to the top of the fluid, and the remaining liquid is used for feeding pigs, etc., or it may even be drunk with advantage and used in place of water for making Scotch porridge. Alum whey used in diarrhœa is prepared by coagulating milk with alum and separating the whey. And the orange and lemon whey, used in medicine are made by coagulating with citric acid, and flavoring the resulting whey with orange or lemon peel.

**Whichcote Benjamin,** an English clergyman; born in Shropshire, England, May 11, 1610. He was provost of King's College (1644); a leader in, if not the founder of the latitudinarian school of English divines; a famous preacher, and one of the Cambridge Platonists. His works were all published posthumously: "Observations and Apophthegms" (1688); "Moral and Religious Aphorisms" (1703; new ed. 1753); "Sermons," etc., (1751). He died in Cambridge, England, May, 1683.

**Whig,** in English history, a term applied to the members of one of the great political parties in Great Britain. Originally it was a Scotch term, and appears to have been first used in Scotland in the reign of Charles I., and in England in that of Charles II. According to Bishop Burnet's account ("Own Times") of the origin of the word:

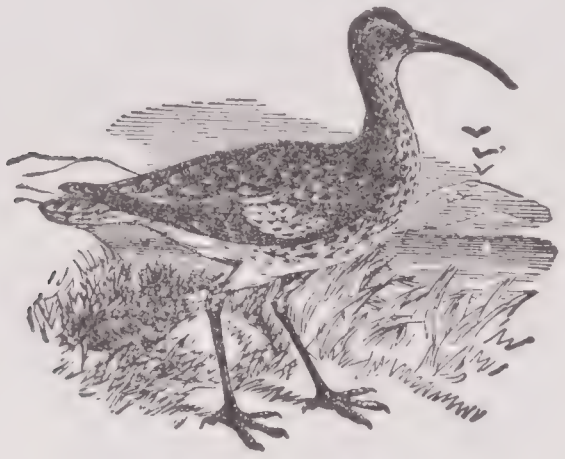
> "The S. W. counties of Scotland have seldom corn enough to serve them all the year round, and the N. parts producing more than they used, those in the W. went in summer to buy at Leith the stores that came from the N. From the word whiggam, used in driving their horses, all that drove were called the whiggamors, contracted into whigs. Now in the year before the news came down of Duke Hamilton's defeat, the ministers animated their people to rise and march to Edinburgh; and they came up, marching on the head of their parishes, with an unheard-of fury, praying and preaching all the way as they came. The Marquis of Argyle and his party came and headed them, they being about 6,000. This was called the 'Whiggamors' Inroad'; and ever after that all who opposed the court came in contempt to be called whigs."

From Scotland the term was transferred to England, and was applied to the political party opposed to the Tories. It was first assumed as a party name by those who were chiefly instrumental in placing William III. on the throne. As a political term it has now almost fallen out of use, being superseded by the term Liberal, the more extreme members of which party have assumed the name of Radicals. Another explanation is generally given — as, for instance, by Macaulay — that Whig was derived from wheg, *i. e.*, whey, and was intended to stigmatize the temper of the Covenanters soured by oppression. Skeat considers this incorrect, and accepts Burnet's etymology, as given in the extract above.

In United States history, the name whig was first applied to the supporters of the cause of the colonies against the English king in the Revolutionary War. The name was doubtless applied to the opponents of the king, from the fact that in England the same name was applied to the opposers of the royal prerogative in the time of James II., who were ultimately successful in unseating that monarch. After the Revolution the name Whig disappeared from politics, and the people of the country divided into Federalists and Democrats. The party platform of both parties, being gradually altered to meet existing exigencies, the name Federalist was dropped and the term Whig again resuscitated and applied to the opponents of the Democratic party. This name was retained till the agitation of the slavery question induced the formation of a new party, advocating the abolition of slavery and composed of recruits from the ranks of both the Democratic and Whig parties. To this new party the name Republican was applied, and after its formation the name Whig disappeared from American politics.

**Whimbrel,** in ornithology, the *Numenius phœopus,* widely distributed from the N. of Europe and Asia to the N. of Africa and India, visiting England in its spring and autumn migrations, occasionally breeding in the Shetland Islands. It resembles the curlew but is smaller, and has a proportionately shorter bill; length of male

16 inches, female somewhat larger; plumage bright ash color, with streaks of brown on neck and breast; a band of yellowish white on middle of head, with a wider brown band on each side; belly and abdomen white; feathers of back and scapulars



THE WHIMBREL.

deep brown in the middle, bordered with brighter brown; tail ashy brown, with oblique brown bands; bill blackish, inclining to red at base; feet lead color. Its flesh is esteemed for the table, and its eggs are as highly valued as those of the plover. See CURLEW.

**Whin,** or **Whinstone,** a name given by miners and others in Scotland to various hard crystalline rocks, of igneous or metamorphic origin, especially greenstone or diorite, and sometimes, though rarely and locally, applied even to granite.

**Whinchat,** in ornnithology, the *Saxicola rubetra,* closely allied to and externally resembling the stonechat, from which it

A WHINCHAT.

may be readly distinguished by the white streaks on the head and neck, by the absence of white on the wing coverts, and by the border of rusty yellow on the feathers of the upper parts; length about five inches.

**Whipping,** a punishment inflicted by the law of England chiefly for minor offenses. The criminal law consolidation acts (1861) enumerate several offenses for which the punishment may be inflicted on males under 16. A subsequent act enacts that when the offender is under 14 the number of strokes is not to exceed 12. In all cases of robbery or intent to rob, where the attempt is accompanied by personal violence, the court may, in addition to the other punishments provided by the laws, direct that the offender, if a male, be once, twice, or thrice privately whipped. This law was chiefly aimed at the practice of garroting. In Scotland no person above 16 is to be whipped for theft or crime.

**Whipple, Edwin Percy,** an American literary critic; born in Gloucester, Mass., March 8, 1819. He published: "Essays and Reviews" (2 vols. 1848–1849); "Lectures on Subjects connected with Literature and Life" (1849); "Character and Characteristic Men" (1867); "The Literature of the Age of Elizabeth" (1868); "Success and its Conditions" (1871); and posthumously published "Recollections of Eminent Men" (1887); "American Literature and Other Papers" (1887); and "Outlooks on Society, Literature, and Politics" (1888). He died in Boston, June 16, 1886.

**Whipper-in,** in fox-hunting, one who keeps the hounds from wandering, and whips them in, if necessary, to the line of scent. In politics, one who enforces party discipline among the supporters of the government or opposition, and urges their attendance in the event of any question of importance being likely to come under discussion, and the house divided thereupon; one who compels to obedience or order; one who subjects to the principles or measures of a party.

**Whippoorwill,** in ornithology, *Caprimulgus* (*antrostomus*) *vociferus,* a goatsucker common in the E. parts of the United States; about 10 inches long; plumage tawny brown, much mottled and indistinctly marked with small transverse bands; top of the head streaked with black, and a narrow white collar on throat. The popular name of the bird is derived from the cry, which bears some resemblance to these words. The habits of the bird are like those of the European goatsucker.

**Whip Snake,** any species of the family *Dryiophidæ.* They may be readily distinguished by their excessively slender back and tail, which has been compared to the thong of a whip, and long and narrow head, which ends in a protruding rostral shield or in a flexible snout. They are arboreal in habit, usually green in color, and feed on birds and lizards. Wallace puts the genera at 5 and the species at 15, all from the tropical regions.

**Whirlpool,** a spot in a river or in the sea in which, through obstructions to flowing water, produced by banks, islands,

rocks, or by winds and currents, a rotatory motion is imparted to the moving fluid. Revolutions of such a nature on a minute scale, may be seen on nearly every streamlet; but the term whirlpool is used almost exclusively of the same phenomenon on a large scale. There is a tendency to vortical motion below most waterfalls. The Maelström, off the coast of Norway, S. W. of the Loffoden Islands, which obtained such celebrity, is in large measure mythic. A strong tidal current runs between the islands of Mosköe and Warae, where it exists, at one time from N. to S., at another in the reverse direction. When the wind acts obliquely on the tidal current, a certain approach to vortical motion may be discerned, but there is no genuine whirl. It is the same with the classic whirlpool alleged to exist between Scylla and Charybdis. There is a tumult of waters in stormy weather, but nothing more. The whirlpool of Coryvrechan, or Corrievreken, alluded to by Scott ("Lord of the Isles"), is situated between the N. of Jura and the little island of Scarba in the Hebrides. The strong current which runs through the channel between the two islands encounters a pyramidal rock rising to within 15 fathoms of the surface, and becoming deflected from the straight course, takes a circular form.

**Whirligig,** or **Whirlgig Beetle** (*Gyrinus Natator*), a beetle which abounds in fresh water in the United States, and may be seen circling round on the surface with great rapidity. Its eyes are divided by a narrow band, so that, though it has only two, it is made to look as if it had four.

**Whirlwind,** a violent wind moving spirally, as if revolving around an axis, which has at the same time progressive motion. Whirlwinds are produced by two currents of air proceeding in different directions, and the course of the whirlwind is determined by the stronger of the two currents. Thus, supposing a whirlwind to arise from a N. wind blowing somewhat to the W. of a S. wind, when the outer currents come in contact if the N. wind is the stronger, the direction of the whirl would be N., W., S., E.; but the whirl current will move in a contrary direction if the S. wind be the stronger. Whirlwinds often originate in the tropics, especially in flat, sandy districts, during the hot season. The ground becoming unequally heated by the sun, gives rise to ascending columns of heated air, which result in whirl currents drawing up large clouds of dust, and frequently doing great damage to buildings and crops. See CYCLONES: WATERSPOUT.

**Whiskered Bat,** the *Vespertilio mystacinus*, inhabiting Central Europe, and widely distributed throughout Asia, occurring occasionally in England. It is a small bat, dark chestnut-brown above. ashy-brown beneath; the hairs on the upper lip are longer than the rest, whence the specific and popular names.

**Whiskey,** an ardent spirit, distilled generally from barley, but sometimes also from wheat, rye, sugar, molasses, etc. There are two varieties — viz., malt whiskey and grain whiskey. The former is of finer quality, and made principally from malted barley and sometimes, though rarely, from rye. The latter is cheaper but stronger, and is made from various substances, as sugar, molasses, potatoes, but principally from unmalted grain, as Indian corn, barley, oats, etc., dried and ground up. If kept sufficiently long, it is equal in quality to malt whiskey.

**Whiskey, Manufacture of.** Kentucky whiskies, or those represented to be such, constitute the majority of those consumed for drinking purposes, either medicinal or otherwise, throughout the United States. At the head of the various processes of distillation, for excellence of quality of the spirit produced thereby, stands that known in Kentucky as "sour mash, fire copper," which is the method that originally established the high reputation of Kentucky whiskey; those since employed, while giving a larger yield of spirit to the bushel of grain, procure it at the expense of the quality and flavor thereof.

In this process the corn and rye meals are scalded or mashed with hot spent beer, which is the liquid residue of the previous distillation. The mash is then allowed to cool to the proper temperature, when malt is added, and the mash, diluted with a sufficient quantity of water, is left to ferment the time established by law. The diluted mash when fermented is called beer. The beer is distilled in three different ways. In the very smallest distilleries, it is sometimes boiled in copper stills, over wood fires; the vapor, passing through a copper coil or worm, immersed in cold water, is condensed and delivered into a receiver. The condensed liquid is called low wines, or singlings. Singlings contain only a small amount of spirit. This manner of boiling the beer is seldom used, as the large quantity of grain contained in the beer makes it apt to cake in the still,; and, becoming scorched, it gives the whiskey a strong, smoky flavor, a very little of which, however, is not considered objectionable. The singlings are doubled or again distilled in small copper stills, or doublers, over wood fires, and the vapor again condensed in a copper worm, whence it is delivered into the whiskey cistern. The usual way of distilling sour mash whiskey is to boil the beer in a wooden still by admitting steam, the

vapor being condensed into singlings; the singlings are doubled as above.

In the third way, the beer is boiled in a copper still, by steam confined in a copper pipe, placed inside of the still. The singlings are doubled in small copper stills, over wood fires, in the same manner described. This latter way is considered a great improvement, as it avoids both the scorching of the grain in distilling the beer and the admission of live steam, while it preserves all the characteristics so highly prized in "sour-mash, fire copper" whiskies. The yield by the sour-mash process is from two to three gallons to the bushel of grain.

It will be noticed that in the manufacture of "sour-mash, fire copper whiskies," by whichever way the beer is distilled into singlings, the grain is always scalded with hot spent beer, which acts as yeast, and live steam is never permitted to enter the mash or singlings, and that there are two separate distillations.

Most whiskey is made by the process known as "steam." In this the corn and rye meals and malt are mixed with water in the mash-tub, where it is scalded with direct or live steam, introduced by means of a perforated pipe at the bottom of the tub. When fully scalded, the mash is cooled down and run into the fermenting tubs. Fresh yeast is used in fermenting, which gives the name of "sweet mash." The still is made of wood and divided into two or three compartments. When the still is charged, a certain amount of beer is placed in each compartment, live steam is admitted into the lower, which boils the beer, and the vapor from it ascends through a curved pipe into the compartment above, where its continued reception boils the charge therein contained; the vapor from this again ascends into the next compartment above, where the same process is repeated. The vapor then passes through a pipe into a wooden doubler, where it boils the low wines; and the vapor arising thence passes into a copper worm, where it is condensed and then run into the whiskey cistern. Only one worm is used and one condensation made. Highwines, as well as whiskey, are manufactured by this process. The yield is from three and a half to four and a half gallons.

In making whiskey by the "steam copper" process, the mash is made and fermented and the beer boiled, in the same manner as for the "steam" process. The same wooden still is used; but, instead of the vapor from the upper compartment passing directly into a wooden doubler, it is run through a worm and condensed into singlings, which are doubled in a copper still by live steam, or by steam confined in a jacket around the still, or sometimes by fire underneath.

Whiskey

In continuous distillation a copper column is used, in which are a number of compartments, connected with each other, as in the "steam" still. The mash is made and the beer boiled in the same manner. The vapor increasing in alcoholic strength as it ascends, whiskey, highwines, and alcohol may be produced at the same time, according to the compartment from which it is drawn.

There are few, even in the trade, that realize the scientific and practical knowledge and unceasing watchfulness in all departments, from the purchase of the grain to the completion of distillation that is necessary for the production of a strictly fine whiskey, to say nothing of the heavy responsibility incurred, and the complicated regulations to be complied with under the laws of Congress.

In locating a distillery a full supply of clear, bright water, that contains the proper chemical qualities, is the first consideration. It is well known to both chemists and practical distillers that water containing a large quantity of sulphate of lime, earthy carbonates, and no organic matter, is best adapted to distilling. The lime and carbonates being dissolved in the acid generated during the fermentation of the mash, mostly pass off in the form of carbonic acid gas, and leaves the water soft and best suited for extracting the active properties of the malt and grain.

Great care has to be taken in the selection of the grain to have it well developed and sound. Musty or unsound grain is fatal to the production of fine whiskey, and its defects become more prominent as the whiskey increases in age. Those distillers most careful to manufacture only fine goods use the grain that is grown in their own section of the country, in order to have both the grain and water spring from the same kind of soil. Successful fermentation requires of the distiller not only constant attention, but also extensive knowledge both of the principles of chemistry and of practical results. It is exceedingly injurious to allow the fermentation to be prematurely concluded or to proceed too long. As a general rule, the slower the fermentation and lower the heat at which the distillation is carried on, the finer and purer will be the spirit.

The mash being made and fermented, and the beer distilled by whatever process, the whiskey is collected in the cistern, and thence run into barrels, under the control of the United States inspector, and in the custody of the United States storekeeper, who has also charge of it while in the bonded warehouse, till the tax is paid. It may be well to mention that from the weighing of the grain when put in the mash tub till the final tax is paid on the whiskey

in the bonded warehouse, every part of the process of manufacture, as well as manufactured whiskey, is under the entire control and supervision of the United States government officials.

Barrels, and the cooperage thereof, require much attention, and must be made of well-seasoned oak. For highwines they are not charred, but for whiskey they should be well charred, as the char has some peculiar chemical effect on the character and ripening of the whiskey that is very desirable.

**Whiskey Insurrection,** the name given to a local outbreak occurring in opposition to the excise law passed by Congress, March 3, 1791. In addition to the general objections urged against the measure, the inhabitants of Western Pennsylvania considered the tax an unfair discrimination against their region and raised an insurrection, causing President Washington to call out an army of 15,000 militia. This show of an unsuspected vigor and resource on the part of the government forced the insurgents to disperse without bloodshed.

**Whispering Gallery,** or **Whispering Dome,** a gallery or dome of an elliptical or circular form, in which faint sounds conveyed around the interior wall may be readily heard, while the same are inaudible elsewhere in the interior. Thus in an elliptical chamber if a person standing in one of the foci speak in a whisper, he will be heard distinctly by a person standing in the other focus, though the same sound would not be audible at the same distance under any other circumstances, or at any other place in the chamber. There is a whispering gallery in the Capitol at Washington, one at St. Paul's Cathedral, London, and another at Gloucester Cathedral, England.

**Whist,** a game of cards, so called from the silence necessary to play it attentively and correctly. It was formerly also called whisk. It is played by 4 persons, 2 of whom are partners against the other 2. The full pack of 52 cards is used, 13 being dealt one at a time to each player in order, the dealer beginning with the player on his left. The last card dealt is turned face up on the table, and is called the trump card; the suit to which it belongs has for the hand the privilege of taking or being superior to any card of any other suit. The cards rank in value as follows: Ace (the highest), king, queen, knave, 10, 9, 8, and so on. The game is commenced by the player on the left hand of the dealer laying one card face upward on the table, this being called leading off; the player on his left then plays a card of the same suit (if he has one), and is followed similarly by the player on his left. When all have played, the person who has played the highest card takes up the 4 cards played, these constituting what is termed a trick. If a player has no card of the suit led off, he may play one of any other suit. The winner of the first trick then leads off with any card he pleases for the second trick, the winner of which becomes the leader of the third trick, and so on. The score is taken as follows when the hand is played out; the partners who conjointly have won the majority out of the 13 tricks, score one point for every trick over 6. The ace, king, queen, and knave are called honors, and the partners who hold between them 3 of these cards score 2 points, and if they hold all of them they score 4 points; this is technically known as scoring 2 (or 4) by honors. If each side holds two of these cards, honors are said to be divided or easy. In long whist (now becoming obsolete) 10 points make a game in short whist only 5 points are required, and in this it is usual to count by tricks alone. A rubber consists of 3 games, and is won by the partners who score 2 of them. If one side wins the first 2 games the third is not played out. There are several modifications of the game, such as solo whist, three-handed whist, bridge whist, compass whist, military whist, duplicate whist, etc.

AMERICAN WHIST RULES.

*Scoring.*—(1) Each trick above six shall count one point; the game shall consist of seven points. In case of tournaments, matches, and club scores for purposes of comparison, each hand shall be played out, and every trick taken shall be scored. The above shall be the standard game, but players or clubs may, by rule or agreement, provide for other methods of scoring.

(2) The penalty for a revoke shall take precedence of all other scores.

(3) If an erroneous score shall be proved, such mistake can be corrected prior to the conclusion of the game in which it occurs, and such game is not concluded until the trump card of the first deal in the following game has been turned up.

*Cutting.*—(4) In cutting, the ace is the lowest card; in all cases every one shall cut from the same pack, and if a player exposes more than one card he must cut again.

*Formation of the Table.*—(5) In the formation of the table those first in the room shall have the preference. If by reason of two or more arriving at the same time, more than four assemble, the preference among the last comers shall be determined by cutting, a lower cut giving the preference over all cutting higher. A complete table shall consist of six; the four having the preference shall play.

(6) The formation of the table having been determined, the players shall cut for partners and deal at the commencement of each game.

(7) In cutting for partners, the two highest shall play against the two lowest; the lowest shall have the deal and the choice of seats and cards, and must abide by his first selection. If the two lowest cut cards of equal value, they shall cut again for deal.

(8) If two players cut intermediate cards of equal value, those two shall cut again, and the lower of the new cut shall play with the original low.

(9) If three players cut cards of equal value those three shall cut again. If the fourth has cut the highest card, the two lowest of the cut shall be partners and the lowest shall have the deal. If the fourth has cut the lowest card, he shall be

Whist

the dealer, and the two highest of the new cut shall be partners.

(10) At the end of the game, should there be more than four members belonging to the table, a sufficient number of the players shall retire to admit those awaiting their opportunity to play. In determining which players shall remain in, those who have played a less number of consecutive games shall have the preference over all who have played a greater number, and between two or more who have played an equal number the preference shall be determined by cutting, a lower cut giving the preference over all cutting higher.

(11) A candidate wishing to enter a table must declare such intention prior to any of the players having cut a card for the purpose either of commencing a new game or of cutting out.

(12) Tables may be formed and partners chosen by agreement, except when prohibited by a club rule.

*Shuffling.*—(13) Before every deal the cards shall be shuffled and shall be presented by the dealer to his right hand adversary to cut.

(14) The pack must not be shuffled so as to expose the face of any card, nor during the play of the hand.

(15) Where two packs are used, the dealer's partner shall collect and shuffle the cards for the ensuing deal, and place them at his right hand.

*Cutting to the Dealer.*—(16) In cutting to the dealer, not less four cards shall be left in each packet.

(17) If in cutting or in reuniting the separate packets a card is exposed, or if there is any confusion of the cards or doubt as to the place where the pack was separated, there must be a fresh cut.

(18) When the pack has been presented by the dealer to be cut, and has been cut by the adversary in accordance with Rules 16 and 17, should the dealer reshuffle the cards he shall lose his deal.

*Dealing.*—(19) The 52 cards shall be dealt into four packets one at a time in regular rotation, beginning with the players at the dealer's left, and having been regularly dealt out, the last, which is the trump card, shall be turned up before the dealer.

(20) There must be a new deal, (a) if during the deal or during the play of a hand the pack be proved incorrect or imperfect; (b) if any card except the last be faced in the pack.

(21) If while dealing the dealer or his partner exposes a card, and neither of the adversaries has touched the cards, the latter may claim a new deal; a card exposed by either adversary gives that claim to the dealer, provided his partner has not touched a card. If a new deal does not take place, the exposed card cannot be called.

(22) If the dealer, before or during the deal, looks at the trump card, his adversaries have a right to see it, and may exact a new deal.

*Misdeal.*—(23) If the dealer in distributing cards (a) gives more than two cards incorrectly, (b) counts the cards on the table or the remainder of the pack, or (c) places the trump card on the other cards without having turned it up, it is a misdeal, and the deal passes to the next player.

(24) If, after playing to the first trick, a player is found to have less than his proper number of cards, and the missing card or cards be found in his adversary's hand, the deal is void; if the missing card or cards be found in his partner's hand, the adversaries may consult, and shall have the choice (a) of retaining the same hands and rectifying the error by drawing a card or cards, or (b) having a new deal.

(25) A misdeal shall not lose the deal, if during the deal either of the adversaries has touched the cards prior to the dealer's partner having done so; but should the latter have first interfered with the cards, notwithstanding either or both of the adversaries have subsequently done the same, the deal is lost.

(26) Should three players have their right number of cards and the fourth have less than 13, and such deficiency be not discovered until after he has played to the first trick, the adversaries may consult and shall have the choice (a) to claim a new deal, or (b) to have the hands played out as they stand, in which case the missing card shall be considered as played to the last trick; but no revoke shall be claimed because of such missing card.

(27) If a pack of cards be imperfect, the deal in which the fault is discovered shall be void, but the previous ones shall hold good.

(28) Any one dealing out of turn, or with the adversary's cards, may be stopped before the trump card is turned, after which the game must proceed as if no mistake had been made.

(29) If the adversaries interrupt a dealer while dealing, either by questioning the score or asserting that it is not his deal, and fail to establish such claim, should a misdeal occur he may deal again.

*The Trump Card.*—(30) The dealer, when it is his turn to play the first trick, shall take the trump card into his hand; if left on the table after the second trick has been turned and quitted, it becomes an exposed card.

(31) If the dealer takes the trump card into his hand before it is his turn to play to the first trick, he shall at the request of his adversaries, at any time before the second trick has been turned and quitted, replace it face up upon the table.

(32) If the dealer, when called upon under the preceding rule to replace the trump card, declares himself unable to recollect it, his highest or lowest trump may be called, and, unless it cause him to revoke, must be played. The call may be repeated, but not changed; that is, from highest to lowest, or vice versa, till such card is played.

*Exposed Cards.*—(33) The following are exposed cards:

(a) The trump card, if left face upward on the table after the second trick has been turned and quitted.

(b) Two or more cards played at once.

(c) Any card exposed in any manner so as to be seen by either player, no matter how exposed, whether dropped on the table, thrown on the table, or held above the table, detached or not detached.

(34) A card is not an exposed card when dropped on the floor, or elsewhere below the table.

(35) All exposed cards shall be liable to be called, must be left face upward on the table, and must not be taken into the player's hand again; the player is bound to play them when they are called, provided he can do so without revoking; the call may be repeated whenever it is the player's turn to play until the card is played. A player cannot be prevented from playing a card liable to be called; if he can get rid of it in the course of play, no penalty remains.

(36) If a player leads a winning card, that is, one better than any his adversaries hold of the suit, and then leads another, or plays several winning cards without waiting for his partner to play, his partner may be called on to take the first trick, and the other cards thus improperly played are exposed cards; it makes no difference whether he plays them one after the other, or throws them all on the table together; after the first card is played, the others are exposed.

(37) A player having an exposed card on the table shall not play till the adversaries have stated whether or not they wish to call that card. If he play another card without waiting, such card shall also become an exposed card.

*Leading Out of Turn.*—(38) If any player leads out of his turn, a suit may be called from him or his partner when it is next the turn of either of them to lead. The penalty shall be exacted by the player on the right of the one from whom the suit is called.

(39) If a player leads out of turn and the other three follow him, the trick is completed, and the error cannot be rectified; but if only the second or the second and third players have played to the false lead, the cards improperly played may be taken back, and such cards cannot be called; the original offender, or his partner, is liable to the penalty for leading out of turn.

(40) If a player called on to lead a suit have none of it, the penalty is paid.

*Playing Out of Turn.*—(41) If the third hand plays before the second, the fourth hand may also play before the second.

(42) Should the third hand not have played, and the fourth hand have played before his partner, the latter may be called on to play his highest or lowest card in the suit led, or, if he have none, to trump or not to trump the trick.

(43) If any one omit playing to a former trick, and such error be not discovered till he has played to the next, the adversaries may claim a new deal. Should they decide that the deal stand good, the surplus card at the end of the hand shall be considered to have been played to the imperfect trick, but shall not constitute a revoke therein.

(44) If any one play two cards to the same trick, or mix the trump card or any other card with a trick to which it does not properly belong, he shall be liable to the same penalty as provided in Rule 26.

*The Revoke.*—(45) It is a revoke when a player, holding one or more cards of the suit led, plays a card of a different suit.

(46) The penalty for a revoke: (a) Is at the option of the adversaries, who at the end of the hand may consult together, and take three tricks from the revoking player and add them to their own; add three points to their own score; or deduct three points from his score (or all his points, if he has less than three). (b) Can be claimed for as many revokes as occur during the hand. (c) Is applicable only to the score of the game in which it occurs. (d) Cannot be divided, that is, a player cannot add one or two to his own score and deduct one or two from the revoking player. (e) Takes precedence of every other score.

(47) A revoke is established if the trick in which it occurs has been turned and quitted, or if either the revoking player or his partner, whether in his right turn or otherwise, lead or play to the following trick.

(48) At the end of a hand the claimants of a revoke may search all the tricks.

(49) If a player discover his mistake in time to save a revoke, the card improperly played becomes an exposed card. Any player or players who have played after him may withdraw their cards and substitute others. The cards so withdrawn are not liable to be called.

(50) If a revoke has been claimed and the accused player or his partner mix the cards before they have been examined to the satisfaction of the adversaries, the revoke shall be deemed established. A revoke may be claimed as soon as perceived, which claim shall be considered notification to the adversaries not to mix the tricks till they have been examined.

(51) A revoke may be claimed at any time before the cards have been presented and cut for the following deal, but not thereafter.

(52) The revoking player and his partner may under all circumstances require the hand in which the revoke has been detected to be played out.

(53) Should the players on both sides subject themselves to the penalty of one or more revokes, neither can win the game; each is punished, at the discretion of his adversary, as provided in Rule 46.

(54) In whatever way the penalty be enforced, under no circumstances can the player win the game by the result of the hand during which he has revoked, and he cannot score more than six.

*Miscellaneous.*—(55) If a player is legally called on to play the highest or lowest of a suit, or to trump or not to trump a trick, or to lead a suit, or to play a card subject to be called, and unnecessarily fails to comply, he shall be liable to the same penalty as if he had revoked.

(56) Any one during the play of a trick and before the cards have been touched for the purpose of gathering them together, may demand that each player draw his card.

(57) If any one, prior to his partner playing, calls attention to the trick in any manner, as by saying that it is his or his adversary's, or by naming his own or his adversary's card, or by placing any of the cards played, without having been lawfully required so to do, his adversaries may require their opponent to play the highest or lowest of the suit then led, or if he have none, to trump or not to trump the trick.

(58) In all cases where a penalty has been incurred, the offender shall await the decision of his adversaries.

(59) When a trick has been turned and quitted, it cannot again be seen till after the hand has been played.

(60) Should any player say, "I can win the rest," "The rest are all mine," "I have won the game," or use words or signs to that effect, his hand shall be laid on the table and treated as exposed cards.

(61) No conversation shall be indulged in during the play of the hand except such as is required or permitted by the foregoing rules.

BRIDGE WHIST RULES.

*The Rubber.*—(1) The rubber is the best of three games. If the first two games be won by the same players, the third game is not played.

*Scoring.*—(2) A game consists of 30 points obtained by tricks alone, exclusive of any points counted for honors, chicane, or slam.

(3) Every hand is played out, and any points in excess of the 30 points necessary for the game are counted.

(4) Each trick above six counts two points when spades are trumps, four points when clubs are trumps, six points when diamonds are trumps, eight points when hearts are trumps, and 12 points when there are no trumps.

(5) Honors consist of ace, king, queen, knave, and 10 of the trump suit. When there are no trumps they consist of the four aces.

(6) Honors in trumps are thus reckoned:

If a player and his partner conjointly hold—

I. The five honors of the trump suit, they score for honors five times the value of the trump suit trick.

II. Any four honors of the trump suit, they score for honors four times the value of the trump suit trick.

III. Any three honors of the trump suit, they score for honors twice the value of the trump suit trick.

If a player in his own hand holds—

I. The five honors of the trump suit, he and his partner score for honors 10 times the value of the trump suit trick.

II. Any four honors of the trump suit, they score for honors eight times the value of the trump suit trick. In this last case, if the player's partner holds the fifth honor, they also score for honors the single value of the trump suit trick.

The value of the trump suit trick referred to in this law is its original value—*e. g.*, two points in spades and six points in diamonds; and the value of honors is in no way affected by any doubling or re-doubling that may take place under Laws 53-56.

(7) Honors, when there are no trumps, are thus reckoned:

If a player and his partner conjointly hold—

I. The four aces, they score for honors 40 points.

II. Any three aces, they score for honors 30 points.

If a player in his own hand holds—

The four aces, he and his partner score for honors 100 points.

(8). Chicane is thus reckoned—

If a player holds no trump, he and his partner score for chicane twice the value of the trump suit trick. The value of chicane is in no way affected by any doubling or re-doubling that may take place under Laws 53-56.

(9) Slam is thus reckoned—

If a player and his partner make, independently of any tricks taken for the revoke penalty—

I. All 13 tricks, they score for Grand Slam 40 points.

II. Twelve tricks, they score for Little Slam 20 points.

(10) Honors, chicane, and slam are reckoned in the score at the end of the rubber.

(11) At the end of the rubber, the total scores for tricks, honors, chicane, and slam obtained by each player and his partner are added up, 100 points are added to the score of the winners of the rubber, and the difference between the two scores is the number of points won, or lost, by the winners of the rubber.

(12) If an erroneous score affecting tricks be proved, such mistake may be corrected prior to the conclusion of the game in which it occurred, and such game is not concluded till the last card of the following deal has been dealt, or, in the case of the last game of the rubber, till the score has been made up and agreed.

(13) If an erroneous score affecting honors, chicane, or slam be proved, such mistake may be corrected at any time before the score of the rubber has been made up and agreed.

*Cutting.*—(14) The ace is the lowest card.

(15) In all cases, every player must cut from the same pack.

(16) Should a player expose more than one card, he must cut again.

*Formation of a Table.*—(17) If there are more than four candidates, the players are selected by cutting, those first in the room having the preference. The four who cut the lowest cards play first, and again cut to decide on partners; the two lowest play against the two highest; the lowest is the dealer, who has choice of cards and seats, and, having once made his selections, must abide by it.

(18) When there are more than six candidates, those who cut the two next lowest cards belong to the table, which is complete with six players; on the retirement of one of those six players, the candidate who cut the next lowest card has a prior right to any after-comer to enter the table.

(19) The two players cutting cards of equal value, unless such cards are the two highest, cut again; should they be the lowest, a fresh cut is necessary to decide which of those two deals.

(20) Three players cutting cards of equal value cut again; should the fourth (or remaining) card be the highest, the two lowest of the new cut are partners, the lower of those two the dealer; should the fourth card be the lowest, the two highest are partners, the original lowest the dealer.

*Cutting Out.*—(21) At the end of a rubber, should admission be claimed by any one, or by two candidates, he who has, or they who have, played a greater number of consecutive rubbers than the others is, or are, out; but when all have played the same number, they must cut to decide on the outgoers; the highest are out.

*Entry and Reëntry.*—(22) A candidate wishing to enter a table must declare such intention prior to any of the players having cut a card, either for the purpose of commencing a fresh rubber or of cutting out.

(23) In the formation of fresh tables, those candidates who have neither belonged to nor played at any other table have the prior right of entry; the others decide their right of admission by cutting.

(24) Any one quitting a table prior to the conclusion of a rubber, may, with consent of the other three players, appoint a substitute in his absence during that rubber.

(25) A player cutting into one table, while belonging to another, loses his right of reëntry into that latter, and takes his chance of cutting in, as if he were a fresh candidate.

(26) If any one break up a table, the remaining players have the prior right to him of entry into any other; and should there not be sufficient vacancies at such other table to admit all those candidates, they settle their precedence by cutting.

*Shuffling.*—(27) The pack must neither be shuffled below the table nor so that the face of any card be seen.

(28) The pack must not be shuffled during the play of the hand.

(29) A pack, having been played with, must neither be shuffled by dealing it into packets, nor across the table.

(30) Each player has a right to shuffle, once only (except as provided by Law 33) prior to a deal, after a false cut, or when a new deal has occurred.

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(31) The dealer's partner must collect the cards for the ensuing deal, and has the first right to shuffle that pack.

(32) Each player, after shuffling, must place the cards, properly collected and face downward, to the left of the player about to deal.

(33) The dealer has always the right to shuffle last; but should a card or cards be seen during his shuffling, or while giving the pack to be cut, he may be compelled to reshuffle.

*The Deal.*—(34) Each player deals in his turn; the order of dealing goes to the left.

(35) The player on the dealer's right cuts the pack, and, in dividing it, must not leave fewer than four cards in either packet; if in cutting, or in replacing one of the two packets on the other, a card be exposed, or if there be any confusion of the cards, or a doubt as to the exact place in which the pack was divided, there must be a fresh cut.

(36) When a player, whose duty it is to cut, has once separated the pack, he cannot alter his intention; he can neither reshuffle nor recut the cards.

(37) When the pack is cut, should the dealer shuffle the cards, the pack must be cut again.

(38) The 52 cards shall be dealt face downward. The deal is not completed till the last card has been dealt face downward.

*The New Deal.*—(39) There must be a new deal —

I. If, during a deal, or during the play of a hand, the pack be proved to be incorrect or imperfect.

II. If any card be faced in the pack.

III. Unless the cards are dealt into four packets, one at a time and in regular rotation, beginning at the player to the dealer's left.

IV. Should the last card not come in its regular order to the dealer.

V. Should a player have more than 13 cards, and any one or more of the others less than 13 cards.

VI. Should the dealer deal two cards at once, or two cards to the same hand, and then deal a third; but if, prior to dealing that card, the dealer can, by altering the position of one card only, rectify such error, he may do so.

VII. Should the dealer omit to have the pack cut to him, and the adversaries discover the error prior to the last card being dealt, and before looking at their cards; but not after having done so.

(40) If, while dealing, a card be exposed by either of the dealer's adversaries, the dealer may claim a new deal. A card similarly exposed by the dealer or his partner gives the same claim to each adversary. The claim may not be made by a player who has looked at any of his cards. If a new deal does not take place, the exposed card cannot be called.

(41) If, in dealing, one of the last cards be exposed, and the dealer completes the deal before there is reasonable time for his adversaries to decide as to a fresh deal, they do not thereby lose their privilege.

(42) If a player, before he has dealt 51 cards, look at any card, his adversaries have a right to see it, and may exact a new deal.

(43) If a player take into the hand dealt to him a card belonging to the other pack, the adversaries, on discovery of the error, may decide whether they will have a fresh deal or not.

(44) Should three players have their right number of cards, the fourth have less than 13, and not discover such deficiency till he has played any of his cards, the deal stands good; should he have played, he is as answerable for any revoke he may have made as if the missing card, or cards, had been in his hand; he may search the other pack for it, or them.

(45) If a pack, during or after a rubber, be proved incorrect or imperfect, such proof does not alter any past score, game, or rubber; that hand in which the imperfection was detected is null and void; the dealer deals again.

(46) Any one dealing out of turn, or with the adversary's cards, may be stopped before the last

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card is dealt, after which the game must proceed as if no mistake had been made.

(47) A player can neither shuffle, cut, nor deal for his partner without permission of his opponents.

*Declaring Trumps.*—(48) The dealer, having examined his hand, has the option of declaring what suit shall be trumps, or whether the hand shall be played without trumps. If he exercises that option, he shall do so by naming the suit, or by saying "No trumps."

(49) If the dealer does not wish to exercise his option he may pass it to his partner by saying "I leave it to you, partner," and his partner must thereupon make the necessary declaration, in the manner provided in the preceding law.

(50) If the dealer's partner make the declaration out of his turn, either of the adversaries has the right, after looking at his hand, but before any declaration is made as to doubling or not doubling, to claim a fresh deal. He may not consult with his partner as to whether this penalty should be exacted or not. If any declaration as to doubling or not doubling shall have been made, or if no new deal is claimed, the declaration so wrongly made by the dealer's partner stands good.

(51) If either of the dealer's adversaries makes the declaration, the dealer may, after looking at his hand, either claim a fresh deal or proceed as if no such declaration had been made.

(52) A declaration once made cannot be altered, save as provided above.

*Doubling and Redoubling.*—(53) The effect of doubling and redoubling, and so on, is that the value of each trick above six is doubled, quadrupled, and so on.

(54) After the trump declaration has been made by the dealer or his partner, their adversaries have the right to double. The dealer's left-hand adversary has the first right. If he does not wish to double, he shall say to his partner "May I play?" His partner shall answer "Yes," or "I double."

(55) If either of their adversaries elect to double, the dealer and his partner have the right to redouble. The player who has made the trump declaration has the first right of redoubling. The question "May I play?" shall be addressed by the dealer's left-hand adversary (after a doubling by him or his partner) to the player who has made the trump declaration, who shall answer "I am satisfied," or "I redouble." If he answer "I am satisfied," the question shall then be addressed to his partner, who shall answer "Yes," or "I redouble."

(56) If the dealer or his partner elect to redouble, their adversaries have the right of redoubling again. The original doubler has the first right. The process of redoubling may be continued indefinitely, the first right to continue the redoubling on behalf of a partnership being in that partner who last redoubled on behalf of that partnership. When he expresses himself satisfied, the right to continue the redoubling passes to his partner.

(57) When the question "May I play?" nas been finally answered in the affirmative, or when the dealer's left-hand adversary, being the last person who has the right to continue the redoubling, expresses himself satisfied, the dealer's left-hand adversary shall lead a card.

(58) A declaration once made cannot be altered.

*Dummy.*—(59) As soon as a card is led, the dealer's partner shall place his cards face upward on the table, and the duty of playing the cards from that hand, which is called dummy, and of claiming and enforcing any penalties arising during the hand, shall devolve on the dealer, unassisted by his partner.

(60) After exposing dummy the dealer's partner may indicate to the dealer the hand from which the dealer has to lead, or if the latter has led from the wrong hand, may draw attention to the error, in which case the dealer must lead from the right hand, unless the second hand has played, when the dealer is not entitled to rectify the error; but the dealer's partner may take no other part in the play of the hand, other than the mechanical part of playing from dummy any card named by the dealer.

(61) The dealer's partner may ask if he (the dealer) has a card of the suit which he may have renounced; but if he call attention to any other incident in the play of the hand, in respect of which any penalty might be exacted, the fact that he has done so shall deprive the dealer of the right of exacting such penalty against his adversaries.

(62) If the dealer's partner, by touching a card, or otherwise, suggest the play of a card from dummy, either of the adversaries may, but without consulting with his partner, call on the dealer to play or not to play the card suggested.

(63) When the dealer draws a card, either from his own hand or from dummy such card is not considered as played till actually quitted.

(64) A card once played or named by the dealer as to be played from his own hand or from dummy cannot be taken back, except to save a revoke, or as provided by Law 60.

(65) The dealer's partner may not look over his adversaries' hands, or leave his seat for the purpose of watching his partner's play.

(66) Dummy is not liable to any penalty for a revoke, as his adversaries see his cards. Should he revoke, and the error not be discovered till the trick is turned and quitted, the trick stands good.

(67) Dummy being blind and deaf, his partner is not liable to any penalty for an error whence he can gain no advantage. Thus, he may expose some, or all of his cards, or may declare that he has the game, or trick, etc., without incurring any penalty; but, having played a card from his own hand, he may not recall that card except to save a revoke.

*Exposed Cards.*—(68) If after the deal has been completed, and before the trump declaration has been made, either the dealer or his partner expose a card from his hand, either of the adversaries may, without consultation with his partner, claim a new deal.

(69) If after the deal has been completed, and before a card is led, any player shall expose a card, his partner shall forfeit any right to double or redouble which he would otherwise have been entitled to exercise; and in the case of a card being so exposed by the leader's partner, the dealer may, instead of calling the card, require the leader not to lead the suit of the exposed card.

*Cards Liable to be Called.*—(70) All cards exposed by the dealer's adversaries are liable to be called, and must be left face upward on the table; but a card is not an exposed card when dropped on the floor, or elsewhere below the table.

(71) The following are exposed cards:

I. Two or more cards played at once.

II. Any card dropped with its face upward, or in any way exposed on or above the table, even though snatched up so quickly that no one can name it.

(72) If either of the dealer's adversaries play to an imperfect trick the best card on the table, or lead one which is a winning card as against the dealer and his partner, and then lead again, without waiting for his partner to play, or play several such winning cards, one after the other, without waiting for his partner to play, the latter may be called on to win, if he can, the first or any other of those tricks, and the other cards thus improperly played are exposed cards.

(73) If either of the dealer's adversaries throw his cards on the table face upward, such cards are exposed, and liable to be called by the dealer.

(74) If all the players throw their cards on the table face upward, the hands are abandoned, and the score must be left as claimed and admitted. The hands may be examined for the purpose of establishing a revoke, but for no other purpose.

(75) A card detached from the rest of the hand of either of the dealer's adversaries, so as to be named, is liable to be called; but should the dealer name a wrong card, he is liable to have a suit called when first he or his partner have the lead.

(76) If either of the dealer's adversaries, who has rendered himself liable to have the highest or lowest of a suit called, or to win or not to win

a trick, fail to play as desired, though able to do so, or if when called on to lead one suit, lead another, having in his hand one or more cards of that suit demanded, he incurs the penalty of a revoke.

(77) If either of the dealer's adversaries lead out of turn, the dealer may call a suit from him or his partner when it is next the turn of either of them to lead, or may call the card erroneously led.

(78) If the dealer lead out of turn, either from his own hand or from dummy, he incurs no penalty.

(79) If any player lead out of turn, and the other three have followed him, the trick is complete, and the error cannot be rectified; but if only the second, or the second and third, have played to the false lead, their cards, on discovery of the mistake, are (subject to Rule 60) taken back; and there is no penalty against any one, excepting the original offender, and then only when he is one of the dealer's adversaries.

(80) In no case can a player be compelled to play a card which would oblige him to revoke.

(81) The call of a card may be repeated till such card has been played.

(82) If a player called on to lead a suit have none of it, the penalty is paid.

*Cards Played in Error or not Played to a Trick.*—(83) Should the third hand not have been played, and the fourth play before his partner, the latter (not being dummy or his partner) may be called on to win, or not to win, the trick.

(84) If any one (not being dummy) omit playing to a former trick, and such error be not discovered until he has played to the next, the adversaries may claim a new deal; should they decide that the deal stand good, or should dummy have omitted to play to a former trick, and such error be not discovered till he shall have played to the next, the surplus card at the end of the hand is considered to have been played to the imperfect trick, but does not constitute a revoke therein.

(85) If any one play two cards to the same trick, or mix a card with a trick to which it does not properly belong, and the mistake be not discovered until the hand is played out, he (not being dummy) is answerable for all consequent revokes he may have made. If, during the play of the hand, the error be detected, the tricks may be counted face downward, in order to ascertain whether there be among them a card too many; should this be the case they may be searched, and the card restored; the player (not being dummy), is, however, liable for all revokes which he may have meanwhile made.

*The Revoke.*—(86) Is when a player (other than dummy), holding one or more cards of the suit led, plays a card of a different suit.

(87) The penalty for a revoke—

I. Is at the option of the adversaries, who, at the end of the hand, may, after consultation, either take three tricks from the revoking player and add them to their own — or deduct the value of three tricks from his score — or add the value of three tricks to their own score.

II. Can be claimed for as many revokes as occur during the hand;

III. Is applicable only to the score of the hand in which it occurs;

IV. Cannot be divided — *i. e.*, a player cannot add the value of one or two tricks to his own score and deduct the value of one or two from the revoking player.

V. In whatever way the penalty may be enforced, under no circumstances can the side revoking score Game, Grand Slam or Little Slam, that hand. Whatever their previous score may be, the side revoking cannot attain a higher score toward the game than 28.

(88) A revoke is established, if the trick in which it occur be turned and quitted — *i. e.*, the hand removed from that trick after it has been turned face downward on the table — or if either the revoking player or his partner, whether in his right turn or otherwise, lead or play to the following trick.

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(89) A player may ask his partner whether he has not a card of the suit which he has renounced; should the question be asked before the trick is turned and quitted, subsequent turning and quitting does not establish the revoke, and the error may be corrected, unless the question be answered in the negative, or unless the revoking player or his partner have led or played to the following trick.

(90) At the end of the hand, the claimants of a revoke may search all the tricks.

(91) If a player discover his mistake in time to save a revoke, any player or players who have played after him may withdraw their cards and substitute others, and their cards withdrawn are not liable to be called. If the player in fault be one of the dealer's adversaries, the dealer may call the card thus played in error, or may require him to play his highest or lowest card to that trick in which he has renounced.

(92) If a revoke be claimed, and the accused player or his partner mix the cards before they have been sufficiently examined by the adversaries, the revoke is established. The mixing of the cards only renders the proof of a revoke difficult, but does not prevent the claim, and possible establishment, of the penalty.

(93) A revoke cannot be claimed after the cards have been cut for the following deal.

(94) If a revoke occur, be claimed and proved, bets on the odd trick, or on amount of score, must be decided by the actual state of the score after the penalty is paid.

(95) Should the players on both sides subject themselves to the penalty of one or more revokes, neither can win the game by that hand; each is punished at the discretion of his adversary.

*Calling for New Cards.*—(96) Any player (on paying for them) before, but not after, the pack be cut for the deal, may call for fresh cards. He must call for two new packs, of which the dealer takes his choice.

*General Rules.*—(97) Any one during the play of a trick, or after the four cards are played, and before, but not after, they are touched for the purpose of gathering them together, may demand that the cards be placed before their respective players.

(98) If either of the dealer's adversaries, prior to his partner playing, should call attention to the trick — either by saying that it is his, or by naming his card, or, without being required so to do, by drawing it toward him — the dealer may require that opponent's partner to play his highest or lowest of the suit then led, or to win or lose the trick.

(99) In all cases where a penalty has been incurred, the offender is bound to give reasonable time for the decision of his adversaries.

(100) If a bystander make any remark which calls the attention of a player or players to an oversight affecting the score, he is liable to be called on, by the players only, to pay the stakes and all bets on that game or rubber.

(101) A bystander, by agreement among the players, may decide any question.

(102) A card or cards torn or marked must be either replaced by agreement, or new cards called at the expense of the table.

(103) Any player may demand to see the last trick turned, and no more. Under no circumstances can more than eight cards be seen during the play of the hand — viz., the four cards on the table which have not been turned and quitted, and the last trick turned.

*Duplicate Whist.* — This consists of two separate games played at the same time. Fourteen or 16 commonly constitute a game, and the hands are played without any break; then the hands having been reproduced, are dealt out in reverse position, so that each set or team of player receives the hands previously held by their opponents. When a game has closed each team has held every card in the pack for every deal, and should have taken 13 tricks each time. In

scoring, every trick over 13 taken counts a point gained, and the number less than 13 shows the points lost. To ascertain the total number of points gained, subtract 13 times the number of original hands from the total score; to ascertain the number of points lost, subtract the total score from 13 times the number of hands played. In the second or duplicate half of the game the players change tables, each one taking the corresponding seat at the other table, and all must play the hands as they find them. The duplicate score is kept on a separate slip, and at the end of the game only is transferred to the regular or original score-card. While the first half of the game is being played all talking concerning cards led or held is prohibited, lest in the second or duplicate half a player meet an advantage or disadvantage.

**Whistle Fish,** *Motella tricirrhata,* the three-bearded rockling. Pennant says the name was applied to the fish because "the Cornish fishermen whistle when desirous of taking this fish, as if by that they facilitate it capture."

**Whistler, James Abbot McNeill,** an American painter; born in Lowell, Mass., in 1834; studied for a time at the United States Military Academy; next went to Paris, worked for two years in the studio of Gleyre, and afterward settled in London. In 1884 he became a member of the Society of British Artists, of which he was president from 1886 to 1889. In France he received a medal (3d class) at the Salon of 1883, a gold medal at the Exposition of 1889, and was "Hors Concours" at the Salon in 1892; and he was made Chevalier (1889) and Officer (1891) of the Legion of Honor. In 1889 he was elected a member of the Munich Academy, and received the Cross of the Order of St. Michael; and in 1900 he took the highest prize at the Exposition Universelle, in Paris.

In 1859 he began to exhibit in the Royal Academy, showing "Two Etchings from Nature," which were followed in 1860 by five dry-point portraits and etchings of Thames subjects, and an oil picture of a mother and child "At the Piano." He exhibited frequently in the Salon, the Academy, the Grosvenor Gallery, the Society of British Artists, and in 1874 and 1892 held exhibitions of his paintings in London.

The finest of his oil pictures are "The Artist's Mother — an arrangement in Black and Gray," shown in the Royal Academy of 1872, awarded a gold medal in the Salon of 1884, and purchased for the Luxembourg Gallery in 1891; the "Portrait of Thomas Carlyle," shown in the artist's exhibition of 1874, and purchased by the Glasgow Corporation in 1891; and the "Portrait of Miss Alexander — Harmony in Gray and Green." In addition to many other portraits, such as those of Señor Sarasate, Miss Rosa Corder, Irving as Philip II., and Lady Archibald Campbell, he produced some fascinating figure subjects and views on the Thames, etc., in oils. He was also a skillful worker in pastels on tinted paper; while as a purely decorative artist he is known by the "Peacock Room," painted in 1877 in Mr. Leyland's house at Prince's Gate, London, and by the "Music Room," in Señor Sarasate's residence in Paris. His etchings include: "The French Set," (13 subjects, Paris, 1858); the "Thames Set" (16 subjects, London, 1871); the "First Venice Set" (12 plates, London, 1880); the "Second Venice Set" (26 plates, 1886). Whistler's art is original and individual. On Feb. 11, 1902, the Philadelphia Academy of Fine Arts awarded him its Gold Medal of Honor. He died Nov. 17, 1903.

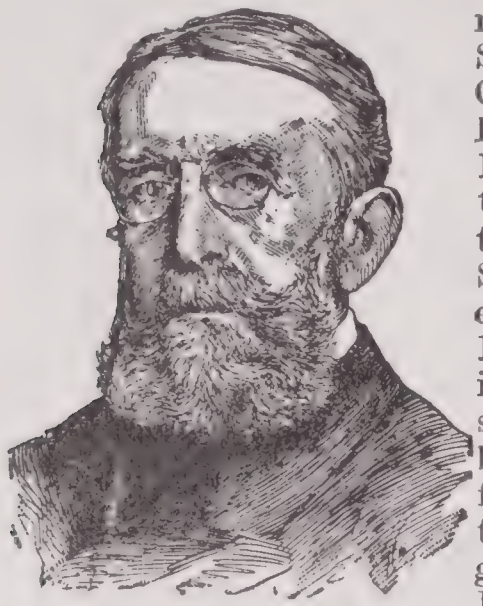
**Whiston, William,** an English mathematician; born in Norton, England, Dec. 9, 1667; studied at Clare Hall, Cambridge, where, having taken his degree in 1690, he was chosen a fellow of his college, and became an academical tutor. Entering holy orders he was appointed in 1694 chaplain to the Bishop of Norwich. In 1696 he published a "Theory of the Earth on the principles of the Newtonian Philosophy"; in 1698 became rector of Lowestoft; and in 1701 was appointed deputy Professor of Mathematics at Cambridge by Sir Isaac Newton, who shortly afterward resigned the professorship in his favor. He was expelled from the university in 1710 for Arian opinions, and the following year was deprived of his professorship. He then removed to the metropolis, and published his "Primitive Christianity," which caused him to be prosecuted as a heretic, though the proceedings were ultimately terminated by an act of grace (1715). Toward the close of his life he became a Baptist. Among his latest labors were his "Memoirs of My Own Life" (1749–1750). Beside numerous original productions he published a well-known translation of the works of Josephus. He died in London, Aug. 22, 1752.

**Whitaker, Alexander,** an American clergyman; born in England, in 1588. He baptized Pocahontas, and officiated at her wedding. He wrote "Good Newes from Virginia," one of the first books written in the colonies. He died in Virginia after 1613.

**Whitby,** a seaport and market-town of England, in the North Riding of Yorkshire; on the Esk river, which forms the harbor, and is crossed by a swing bridge; 16 miles from Scarborough. It has dockyards for the building of ships, and commodious dry docks. Jet is collected here.

White

**White, Andrew Dickson,** an American diplomatist; born in Homer, N. Y., Nov. 2, 1832. He was graduated at Yale in 1853; travelled in Europe; studied at Sorbonne and College de France, 1853–1854; attaché to legation of the United States, St. Petersburg, 1854–1855; studied in the University of Berlin, 1855–1856; Professor of History and English Literature University of Michigan, 1857–1863; returned to Syracuse and elected State Senator, in which capacity (1863–1867) he introduced reports and bills codifying the schools laws, creating a new system of normal schools, establishing a new health board in the city of New York, and incorporating Cornell University at Ithaca; chosen first president of that university, 1866; visited Europe to purchase books and apparatus therefor, and make special study of European educational methods; has in addition to the presidency filled the chair of modern history; was appointed by President Grant, commissioner to Santo Domingo to study and report on question of annexation, 1871; by the State of New York Commissioner to Paris Exposition, 1878; by President Hayes minister to Berlin, 1879–1881; by President Harrison minister to St. Petersburg, and continued under President Cleveland, 1892–1894; appointed member of the Venezuelan Commission, 1895–1896; ambassador to Berlin under President McKinley, 1897, resigned Aug. 5, 1902; president of the American delegation to the International Peace Congress at The Hague in 1899. Mr. White was a regent of the Smithsonian Institution and an officer of the Legion of Honor of France. His principal works are: "The Warfare of Science" (1876); "History of the Warfare of Science with Theology in Christendom" (1897); "European Schools of History"; "The New Germany"; etc.



ANDREW D. WHITE.

**White, Edward Douglas,** an American jurist; born in the parish of Lafourche, La., Nov. 3, 1845; was educated at Mount St. Mary's College, Md., and at the Jesuit College in New Orleans. During the Civil War he served in the Confederate army. After the war he practised law. He was State Senator of Louisiana in 1874; associate justice of the Supreme Court of Louisiana in 1878; United States Senator in 1889-1894; Associate Justice of the United States Supreme Court in 1894-1910; and was appointed Chief Justice of that Court, Dec. 12, 1910.

**White, Eliza Orne,** an American author; born in Keene, N. H., Aug. 2, 1856; was educated under public and private tutors and devoted herself to literature. Her publications include: "Miss Brooks" (1890); "Winterborough" (1892); "When Molly Was Six" (1894); "The Coming of Theodora" (1895); "A Little Girl of Long Ago" (1896); "A Browning Courtship and Other Stories" (1897); "A Lover of Truth" (1898); "Edna and Her Brothers" (1900); etc.

**White, Gilbert,** an English naturalist; born in Selborne, England, July 18, 1720; He wrote: "The Natural History and Antiquities of Selborne in the County of Southampton" (1789); and a posthumous work edited from his papers, "The Naturalist's Calendar, with Observations in Various Branches of Natural History" (1795). Many naturalists have published editions of his works with annotations. John Burroughs wrote an introduction to the edition of 1895. His "Letters" were published in 1876. He died in Selborne, June 20, 1793.

**White, Greenough,** an American educator; born in Massachusetts in 1863; became an Episcopal clergyman. He was Professor of Literature and of Ecclesiastical History at the University of the South, Sewanee, Tenn., 1885–1894. He wrote: "Sketch of the Philosophy of American Literature"; "The Rise of Papal Supremacy"; "Outline of the Rise of the Philosophy of English Literature." Died in 1901.

**White, Henry Kirke,** an English poet, born in Nottingham, England, March 21, 1785; was the son of a butcher, and being of a delicate constitution he was put to the trade of stocking weaving. From his infancy he manifested great love of learning, and at the age of 14 produced some notable specimens of poetry. He published, in 1803, a poem called "Clifton Grove"; and after his death his "Remains," consisting of poems, letters, etc., were edited by Southey. He died in Cambridge, England, Oct. 19, 1806.

**White, Horace,** an American editor; born in Colebrook, N. H., Aug. 10, 1834. He settled in Chicago, was editor of the Chicago "Tribune" (1864–1874); and subsequently became connected with the New York "Evening Post." He wrote many pamphlets and essays on political, social, and financial topics, the best known being: "The Silver Question"; "The Tariff Question"; "Coin's Financial Fool"; "Money and Banking Illustrated by American History"; "The Gold Standard"; and edited Luigi Cossa's "Scienza delle Finanze"

(1888), and Frédéric Bastiat's "Sophismes Économiques" (1889).

**White, John Blake,** an American artist; born near Eutaw Springs, S. C., Sept. 2, 1781; studied under Benjamin West in London in 1800–1804. Returning to the United States he established himself in Boston, but on account of the lack of practice went to Charleston, S. C., and became a lawyer; was successful in the latter profession, and was several times a member of the South Carolina Legislature. His paintings include: "Battle of Eutaw Springs" (1804); "Battle of Fort Moultrie" (1806); "Battle of New Orleans"; "Mrs. Motte Presenting the Arrows"; and "Marion Inviting the British Officer to Dinner" (1836): He also wrote the dramas "Foscari, or the Venetian Exile" (1805); "Mysteries of the Castle" (1806); "Modern Honor" (1812); "Triumph of Liberty, or Louisiana Preserved" (1819); and "Intemperance" (1839). He died in Charleston, S. C., Aug. 24, 1859.

**White, Joseph Blanco,** an English clergyman; born in Seville, Spain, July 11, 1775. He edited in England, in the interests of Spanish independence, a monthly journal, "El Español (1810–1814): also "Las Variedades" (1822–1825); and the London "Review" (1829). He evolved from a Catholic priest through the Church of England into a Unitarian minister. Some of his publications are: "Letters from Spain, by Leucadio Doblado" (1822); "Practical and Internal Evidence Against Catholicism" (1825); "The Poor Man's Preservative against Popery" (1825); "Second Travels of an Irish Gentleman in Search of a Religion" (2 vols. 1833). Coleridge pronounced his "Night and Death" the finest sonnet in the English language. He died in Liverpool, England, May 20, 1841.

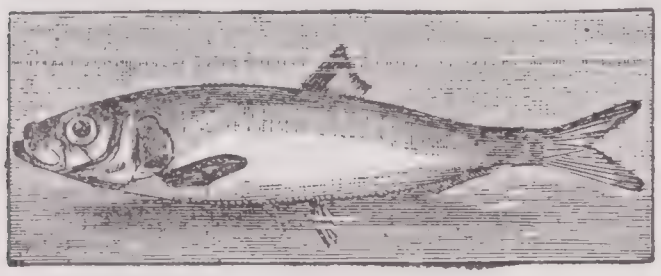
**White, Richard Grant,** an American Shakespearean scholar; born in New York city, May 22, 1822. His journalistic work was in connection with the New York "Courier and Enquirer" (1851–1858), and "World" (1860–1861); and the London "Spectator" (1863–1867), for which he wrote "Yankee Letters." Among his published books are: "Biographical and Critical Handbook of Christian Art" (1853); "Shakespeare's Scholar" (1854); "National Hymns: A Lyrical and National Study for the Times" (1861); "Memoirs of the Life of William Shakespeare, with an Essay towards the Expression of his Genius," etc., (1865); "Poetry of the Civil War" (1866); "Words and their Uses" (1870); "England Without and Within" (1881); "The Riverside Shakespeare," with biography, introductions and notes (1883, 3 vols.); an annotated edition of Shakespeare, (1857–1865, 12 vols.). He published one novel, "The Fate of Mansfield Humphreys" (1884). He died in New York city, April 8, 1885.

**White, William,** an American clergyman; born in Philadelphia, Pa., April 4, 1748. He was graduated at the College of Philadelphia in 1765; completed his theological studies in 1770; and went to England to obtain holy orders. The degree of D. D., the first honorary degree of the University of Pennsylvania, was conferred on him in 1782. During the Revolutionary War, Dr. White sided zealously with the colonies. In 1786 he was elected bishop, being consecrated in Lambeth palace, England, in 1787. He lived to see the Church in the States thoroughly organized, consecrating 11 bishops. He died in Philadelphia, July 17, 1836.

**White Ants,** in entomology, a popular name for any of the *Termitidæ*. The resemblance to the ants, *Formicidæ*, etc., is in the general aspect, their life in social communities, the appearance at certain times of many winged individuals, and the nature of the habitations. But they belong to different orders, the venation of the wings being different. A white ant looks not unlike a soft immature earwig, but without the forceps. White ants constitute the most destructive insect pests to be found in the tropics. They do not attack human beings, their ravages being confined to property. They make their way into houses through some minute aperture which they have themselves formed in the floor or in the wall. Up to the moment of emergence they give no indication of their existence, and when they come forth, which they do in thousands, they take every means in their power to shun observation, while busily engaged in destructive work. Nothing external may reveal the fact that the joists or rafters on which they have been operating are weakened and rendered unsafe by being all pierced internally with their galleries. If they can effect an entrance into a library they bring up mud and construct tunnels with it so as to glue one book to another, and eat away the leather or cloth by which the boards were affixed to the book itself, besides rounding off the angles of a number of the volumes. Whatever is in danger of them is placed on a table or frame, the legs of which rest on stone stands, surrounded by water; but sooner or later the native servant forgets to replenish the water, the white ants immediately taking advantage of the neglect, or they attempt to swim. Some perish, while the survivors pass the fosse on the dead bodies of their comrades and are soon at work. Every historical document in India is in danger from these destructive creatures. Professor Drummond suggests that white ants probably render the same service

in the tropics which earthworms do in temperate lands.

**Whitebait,** the name by which the fry of the herring, (*Clupea harengus*) and sprat (*Clupea sprattus*) are known in the market,



WHITEBAIT.

and when served for the table. It was formerly regarded as a distinct species of the family *Clupeidæ,* and was called by Cuvier and Valenciennes *Rogenia alba,* by Yarrell and several other British naturalists, *Clupea alba.* Its true nature has long been definitely established, and it is by no means difficult to recognize in specimens of whitebait the characteristic specific characters of herring or sprat as the case may be. Whitebait fishing in the Thames is carried on chiefly from February to August, and it has been found that in February and March only 5 to 7 per cent. of the fish were herring fry, 93 to 95 per cent. being young sprats, while in June and July the proportions were reversed, 75 to 87 per cent. being herrings, and the remainder sprats. The length of these little fish is from 1 to 3½ inches. Whitebait are almost always taken in stow nets or bag nets, large funnel-shaped nets fixed to the rope by which the fishing boat is moored. The boat is stationary in the tide-way, the fish are carried by the tide into the open mouth of the net, and collect in the small-meshed blind, or cod end of the net. The fry of the herring and sprat occur in abundance at the mouths of rivers and in tidal estuaries wherever the adults are numerous in the neighborhood. Shad fry (*C. finta* and *alosa*) also sometimes occur with the young of sprats and herrings. For the table whitebait are fried with flour or crumbs; they are often laid on a napkin and sprinkled with fine flour and a little salt, rolled about till well covered with flour, and then thrown into a pot of boiling lard, where they remain till they are of a pale straw color.

**White-bordered Butterfly,** the *Vanessa antiopa,* a butterfly, better known as the Camberwell beauty. Wings purplish-chocolate, with broad whitish hind margins, and a broad black band with six or seven blue spots on each wing, the fore pair also with two whitish spots. Caterpillar spinous, black, dotted with white, and with a red spot on each segment from the fourth to the eleventh; it feeds on *Salix alba.*

**Whiteboys,** the name of an illegal association formed in Ireland about 1760. The association consisted of starving day laborers, evicted farmers, and others in a like condition, who used to assemble at nights to destroy the property of harsh landlords or their agents, the Protestant clergy, the tithe collectors, or any others that had made themselves obnoxious in the locality. In many cases they did not confine their acts of aggression merely to plunder and destruction, but went the length of murder.

**White Brethren,** in Church history, a body of enthusiasts who appeared in Italy at the beginning of the 14th century, and, under the leadership of a priest claiming to be Elias, declared a crusade against the Turks in order to obtain possession of the Holy Land. They were met at Viterbo by the papal troops, and were dispersed. Their leader was carried to Rome, where he was burnt as a heretic in 1403.

**White-candlewood,** the *Amyris toxifera,* a large tree with pinnate leaves and bunches of purple pear-shaped fruits, tasting like the balsam of copaiba. The juice of the tree is as black as ink; its wood has a pleasant smell and takes a fine polish. It grows in the Carolinas.

**White Caps,** lawless bands in Southern Indiana, who, from 1880, undertook the regulation of the manners and morals of that section. During the Civil War the Knights of the Golden Circle flourished in the same parts. In Kentucky were the Ku-Klux, and on the N. side of tne Ohio were their counterpart, the Knights. These Knights of the Golden Circle were what were called Copperheads in other parts of the North — persons who sympathized with the South but lived in the North. The Knights behaved extraordinarily like the White Caps. They met in secret places, wore regalia which they donned in the woods, rode by night, attempted to regulate the people with whom they lived, and held their hands against society and law. The hotbed of the Knights of the Golden Circle was Brownsville, in the S. part of Orange county, close to the border of Crawford co., Ind. These Knights went so far as to declare war on the North early in the rebellion. Militiamen and a regiment of United States troops were sent to quell them, but they disbanded, and the most desperate among them took up their quarters on a island called Vincennes, where the White and Patoka rivers join. They created great disorder afterward. They lived like guerrillas and preyed on their opponents, even going so far as to pull people out of their beds to rob them. Soon after the close of the war what was called a Vigilance Committee was organized in this same corner of Orange and Crawford counties, and several whippings

were given by them, the first one being that of a man named Ross, who was accused of not providing for his family as well as he might have done. Subsequently the people of the region were startled by the doings of those of their neighbors who called themselves the Knights of the Switch. These regulators of the morals of their neigborhoods dressed differently in different parts of the country which they terrorized. Where they were regularly organized and did the most mischief, around English and Marengo, they had nearly a full uniform, a complete regalia. They wore white paper foolscaps, with paper masks, and coats of coffee sacking. To make the coats they merely cut arm or sleeve holes in the sides of coffee sacks close to the bottoms and holes in the bottoms to put their heads through. The whole White Cap movement was borrowed from English outlawry.

**White Chapel,** a celebrated parish of London, England, where the mysterious "Jack the Ripper" operated in 1888–1891. It contains the London Hospital and the Tower of London, and has a population of about 30,000.

**White City,** a popular name given to the grounds on which the World's Columbian Exposition was held, because white was the predominating color of the exterior of the buildings.

**White Clover,** the *Trifolium repens,* a perennial creeping plant, sometimes a foot and a half high, the leaflets obovate or obcordate, toothed, sometimes with a semilunar band at the base; flowers white or somewhat roseate.

**White Colors.** The principal white pigment, and the most important of all painters' colors, is white lead. Baryta yields several commercial varieties of white color, largely used for adulterating white lead. The substances used are heavy spar, the native sulphate, and witherite, the native carbonate of baryta. An artificial sulphate of baryta is also used in permanent white. Zinc white or Chinese white is a hydrated oxide of zinc, and pearl white is yielded by the nitrate of bismuth. A fine chalk yields Spanish white, and whiting is ordinary ground chalk. Quicklime is a sanitary white for external walls, etc.

**White Cross,** an organization similar in many respects to the famous Red Cross, from which it differs chiefly in the fact that it is distinctly American. It was founded in 1898 by Mrs. Jane Creighton, of Portland, Or., who became its first president. Its emblem is designed to represent the cross bandages of white on the blood-red field of war, encircled by the blue of the firmament, comprising the triple color of the Union. The motto of the organization is "Truth, Charity and Philanthropy," and its purposes include not only the caring for wounded and sick American soldiers and sailors, but the aiding of the widows and orphans of those who are killed in battle or die of disease or accident. The organization is self-supporting, and all it asks of the National government is recognition and protection.

**White Cross Society,** a society instituted in or about 1883, at Bishop-Auckland, England, to urge on men the obligation of personal purity; to raise the tone of public opinion on questions of morality; and to inculcate a respect for womanhood.

**White Elephant,** an elephant affected with albinism. Such animals appear to have been known to the ancients. They are highly esteemed by some Eastern potentates, and are considered sacred in Siam. A specimen purchased by the late P. T. Barnum from King Theebaw of Burma was brought to the United States in 1884. It stood seven feet and a half high, and the face, ears, front of trunk, fore feet, and part of breast were of a light ash color. Figuratively, a present which does one much more harm than good, or more generally any nominal advantage which has this effect. It is generally reported that when the King of Siam desires to ruin any one, he makes him a present of a white elephant. The sacred elephant has an enormous appetite, and, being sacred, it is a crime to let it die, so that the gift generally entails ruin on the recipient.

**White Feather,** the symbol of cowardice, a term introduced in the days when cock fighting was in vogue. As a thoroughbred game cock has no white feathers, a white feather was a proof that the bird was not game. (Generally used in the phrases, "To show the white feather," "To have a white feather in one's wing.")

**Whitefield, George,** an English clergyman; born in Gloucester, England, Dec. 16, 1714. At the age of 18 he entered as servitor at Pembroke College, Oxford, where he became acquainted with the Wesleys, and joined the small society which procured them the name of Methodists. He was ordained deacon in 1736, and soon became very popular as a preacher. In 1738 he went to the American settlement of Georgia, where his ministrations gave great satisfaction to the colonists. In the following year he returned to England to procure subscriptions for building an orphan house in the settlement. Having taken priests' orders, he repaired to London, where the churches in which he preached proved incapable of holding the crowds who assembled to hear him. He now adopted preaching in the open air, and visited various parts of the country, addressing vast audiences. In 1739 he again embarked for America, and made a tour through several of the provinces,

preaching with great effect to immense crowds. He returned to England in the following year, where for a time differences between him and Wesley deprived him of many followers. After visiting many parts of England, Scotland, and Wales he again returned to America, and remained there nearly four years. Soon after his return he was introduced to the Countess of Huntingdon, who made him one of her chaplains. A visit to Ireland and two more voyages to America followed, and for several years his labors were unremitting. He was the founder of the Calvinistic Methodists (*q. v.*). On his seventh visit to America, he died in Newburyport, Mass., Sept. 30, 1770. See METHODISM; WESLEY.

**Whitefish,** one of various fishes that are white or nearly so. The name is especially applied to fishes of the genus *Coregonus* of the salmon family, abundant in rivers and lakes of the northern hemisphere. *C. clupeiformis* of the Great Lakes is one of the best of food fishes.

**White Friars.** See CARMELITES.

**White Goby,** a small goby, common in some parts of Europe. It has a transparent body, a wide mouth, and a single row of teeth, lives but one year, and is the only known instance of an "annual" vertebrate. The spawning season is June and July; the eggs are hatched in August, and the young fish attain their full growth between October and December. In July and August the adults die off, and by September only the fry are to be found.

**White Gunpowder,** a white explosive mixture, invented by Augendre and composed of chlorate of potash (2 parts), loaf-sugar and ferrocyanide of potassium (each 1 part), separately pulverized and mixed dry. It has a very great explosive power and is readily inflamed, but a liability to explode from a shock or friction and other disadvantages unfit it for practical use.

**White Hats, The,** in Flanders, in the 14th century, the badge of the democratic party, led by Jacob van Artevelde, the great brewer of Ghent, who was elected their captain in 1338, and was assassinated in 1345. Their next captain was John Lyon, who was supposed to be poisoned by the court party in 1381. Philip van Artevelde, son of the great brewer, next assumed the white hat of the party. He was slain in the battle of Rosebeque, in November, 1382. White hats were used in England to denote radical proclivities, because Orator Hunt (1773–1835), the great demagogue, during the Wellington and Peel administration, used to wear a white hat. Lord Liverpool, who was prime minister for 15 years (1812–1827), rendered the badge no longer distinctive by adopting a white hat himself.

**Whitehaven,** an important mining center and seaport of Cumberland, England; on a level inlet between precipitous cliffs; 38 miles S. W. of Carlisle, and 10 miles from Workington. The town contains numerous churches belonging to the various Protestant denominations, of which the latest (built by the Congregationalists, 1875) has a fine Gothic spire 110 feet high, several schools, a mechanics institute, a library, public baths, etc. There are manufactures of coarse cloth, earthenware, soap, etc., but the prosperity of the town is chiefly due to the immense seams of coal and of hæmatite iron ore in its vicinity, some of which are wrought a distance of two miles under the sea. There are also large rope works and shipbuilding yards. Pop. (1901) 19,324.

**Whitehead, Charles,** an English poet; born in London, England, in 1804. He became a journalist in Australia, and wrote many poems, plays, and sketches. His first published work was "The Solitary" (1831). Other well-known ones were: "The Autobiography of Jack Ketch"; "Richard Savage" (1842), which D. G. Rossetti called "a remarkable book"; and "The Cavalier," a drama produced at the Haymarket Theater, London. He died in Melbourne, Australia, July 5, 1862.

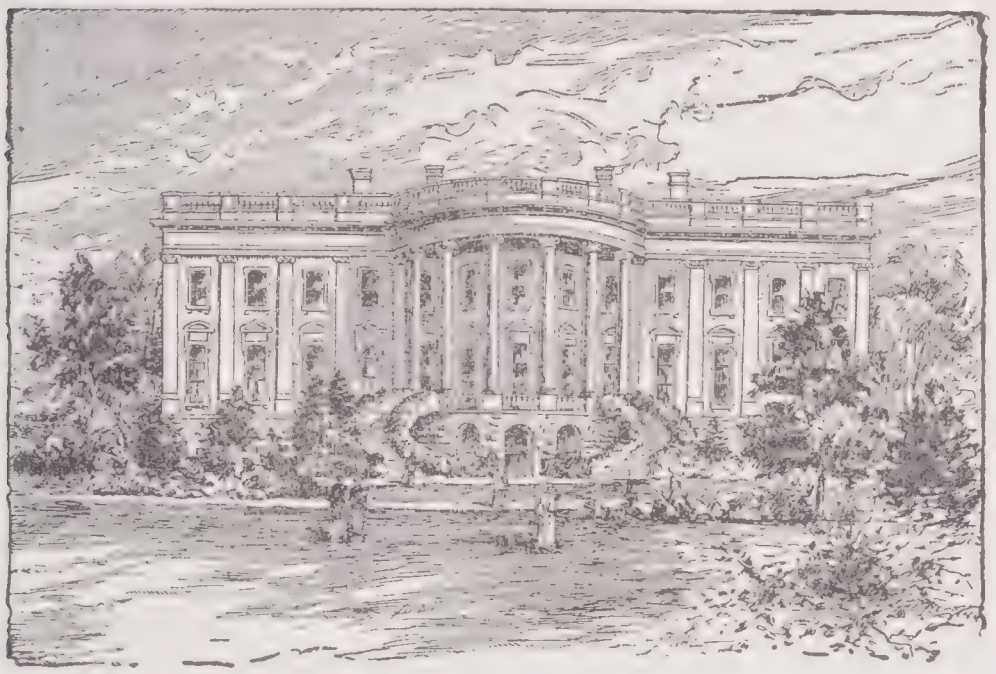
**Whitehead, William,** an English poet; born in Cambridge, England, in 1715. He was educated at Winchester and Cambridge, was secretary and registrar of the Order of the Bath, and became poet-laureate in 1757, succeeding Colley Cibber. He wrote: "The Roman Father," a tragedy; "The School for Lovers," a comedy; and other dramas and poems. He died April 14, 1785.

**Whiteheaded Titmouse,** a name sometimes given to a species of *Acredula*, from Scandanavia and Germany, in which the whole of the head is white. It is closely allied to, if not identical with, the long-tailed titmouse, *A. caudata*.

**White Horse of Berkshire,** in the county of Berks, England, a figure 170 yards long, cut in the side of a hill. A long way off it looks as though drawn in chalk lines, but the outlines are really deep ditches in the soil, kept clean and free from grass by the people, who take great pride in it. The ditches are six yards wide and two feet deep. The eye of the horse is four feet across, and the ear is 15 yards long. It can be seen for 16 miles. When the time comes to clear out the ditches the people make a sort of picnic of it, and play all sorts of rustic games. It is believed to have been constructed as a memorial of a great victory gained by the Saxons over the Danes in the reign of King Egbert.

**White House,** a name applied to the presidential mansion in Washington, D. C.

The name arose from the fact that it is built of stone and painted white. The total length is 170 feet; depth 86 feet; height two stories, with a portico, containing the main entrance on the N. side. The corner stone was laid in 1792; the house was first occupied by President Adams in 1800; burned by British troops in 1814; and restored in 1818. By metonymy the name has been applied to the office of the presidency itself. There are several other mansions and plantations in the Southern States which have borrowed this title.



THE WHITE HOUSE, IN WASHINGTON, D. C.

**White Lady,** a spectral figure which, according to popular legend, appears in many of the castles of Germany, as at Berlin, Neuhaus in Bohemia, Ansbach, Beyrout, Kleve, Darmstadt, Altenburg, as also in London, Copenhagen, Stockholm, and elsewhere, by night as well as by day, particularly when the death of any member of the family is imminent. She is regarded as the ancestress of the race, shows herself always in snow-white garments, carries a bunch of keys at her side, and sometimes rocks and watches over the children at night when their nurses sleep. The earliest historical instance of this apparition occurred in the 15th century, and is famous under the name of Bertha of Rosenberg (in Bohemia). The White Lady of other princely castles was identified with Bertha, and this was accounted for by the intermarriages of other princely houses with members of the house of Rosenberg. In the Schloss of Berlin she was seen in 1598, 1619, 1667, 1688, and again in 1840, 1850, and 1879. The White Lady of Avenel, in Scott's "Monastery," is an ineffective imitation. It was long a common belief in the Highland that many of the chiefs had some kind spirit to watch over the fortunes of their house. Popular tradition has many well-known legends about white ladies, who generally dwell in forts and mountains as enchanted maidens waiting for deliverance. They delight to appear in warm sunshine to poor shepherds or herd-boys. They are either combing their long hair, or washing themselves, drying wheat, beating flax, or spinning; they also point out treasures and beg for deliverances, offering as reward flowers, corn, or chaff, which gifts turn in the instant into silver and gold. They wear snow-white, or half white half black garments, and yellow or green shoes. All these and many other traits that appear in individual legends may be traced back to a goddess of German mythology who influences birth and death and presides over the ordering of the household. Still more distinctly the appellation White Lady and the name Bertha point back to the great goddess of nature, who appears under various names, and who, as Berhta ("the brilliant"), held her circuit on the Twelfth-night and revealed her power. When the legend goes on to say that the Bohemian Bertha of the 15th century promised the workmen of Neuhaus a sweet soup on the completion of building the castle, and that this soup, along with carp, is still given in remembrance of it to the poor on Maundy Thursday, we may be permitted to recognize again the festival dishes consecrated to Berhta, such as fish, oatmeal gruel or dumplings, etc., which it is still customary to eat about the time of Twelfth-night and Christmas in most districts of Germany.

**White Lead,** a dense white powder, insoluble in water, but easily dissolved in dilute nitric or acetic acid; extensively employed in painting.

**White League,** the name given a semi-military organization, gathered to repress the negroes of the State of Louisiana, who, it was asserted, were meditating insurrection. The organization had its inception in the city of New Orleans, in 1874, and on the refusal of the city authorities to allow the landing of a cargo of firearms, which the league had imported from New York, a riot ensued which resulted in more than 100 deaths. The league afterward became a powerful factor in Louisiana politics. The existence of this organization was an occasion of much rancorous argument, their opponents charging them with fraud and intimidation in the matter of elections, while their friends on the other hand, and perhaps justifiably, claimed that such an

organization was necessary to hold in check a lawless and irresponsible element with which the municipal and State governments had shown themselves utterly unable to cope. In late years the organization has been in a state of quiescence, for though on more than one occasion mob violence has temporarily been exerted in the State, the acts done could not be traced to the agency of the league.

**White Leprosy,** in pathology, leprosy characterized by morbid whiteness of the skin. (II. Kings v: 27; Exod. iv: 6.) Probably the tuberculated variety of *Elephantiasis græca.* It does not exactly correspond to the ancient description, but diseases often somewhat alter their character. It is still characterized at one stage by white spots, and the change to white of the hair of the head and beard, but the whole surface of the skin is not white. There is also a leucopathic sub-variety of the non-tuberculated leprosy, in which there are white spots or blotches on the skin.

**White Light,** the apparently simple sensation which is nevertheless really produced on the retina by a certain mixture of colors. Ordinarily white light is composed of the whole of the visible colors of the spectrum, as in sunlight; and the fact of white resulting from this mixture can be demonstrated in many ways, as by re-uniting the spectral colors themselves, or by revolving rapidly a disk painted with the colors in separate sectors. A similar mixture of pigments fails, partly because the pigments themselves are never pure colors, and partly and chiefly because pigments act rather as absorbents of the light reflected from the paper or other colors underneath than as additional illuminating colors. White light can, however, be also compounded of three, or of only two colors, which are then called complementary colors. Such white is quite indistinguishable by the eye from white compounded of all the colors; and hence it follows that the eye is not an ultimate appeal in such matters, but is easily deceived by apparently similar total results really compounded of quite different materials. The same applies to colors, which can also be imitated so far as the eye can judge, but analysis by the prism reveals the different composition of the light instantly.

**Whitelocke, Bulstrode,** an English diplomatist; born in London, Aug. 2, 1605. He was elected to the Long Parliament of 1640, acted as chairman of the committee for drawing up Strafford's charges of impeachment, and was one of the commissioners appointed to treat with the king at Oxford; but during the Troubles he steered a uniformly middle course, as member of the Westminster Assembly (1643) opposing the adoption of Presbyterianism, as governor of Windsor (1644) saving the royal library and cabinet of medals from dispersion, and as a commissioner of the Great Seal (1649) withholding his consent to Charles's death. Ambassador to Sweden (1653), he concluded a treaty with Queen Christina, and by her was made knight of the order of Amartha, on his return becoming a commissioner of the Treasury (1655), Speaker of the House of Commons (1656), and one of Cromwell's lords (1657). He helped, however, to dethrone the Protector's son, and after the Restoration lived unmolested at Chilton Park, his Wiltshire seat, where he died, Jan. 28, 1676. From his MSS. have been published "Memorials of English Affairs from the beginning of the Reign of Charles I. to the Restoration" (1682, new ed. 4 vols. 1852), "Memorials of English Affairs from Brute to the end of the Reign of James I." (1709), "Journal of the Swedish Embassy" (1772, new ed. 2 vols. 1845), and other works.

**White Man's Grave,** Sierra Leone, from the deadly nature of its climate to Europeans.

**White Metal,** a term usually applied to an alloy in which zinc, tin, nickel, or lead is in such quantity as to give it a white color. Also, any of the soft metals, usually of a light color, used for bearings in machinery.

**White Mountains,** a mountain chain of New England, regarded as an outliner of the Appalachian range, commences at the head waters of the Aroostook river, in Maine, where its first summit is Mount Katahdin, and extends in a broad plateau, from 1,600 to 1,800 feet high nearly across New Hampshire, where it has 20 bold peaks, with deep narrow gorges, wild valleys, beautiful lakes, lofty cascades and torrents, forming the "Switzerland of America," and a favorite resort of summer tourists. Mount Washington is the highest summit in New England. The other peaks of the White Mountains proper are Mount Madison, Mount Clay, Mount Jefferson, Mount Monroe, and Mount Adams. In the Franconia group are Lafayette and Moose Hillock. These mountains furnish the chief sources of the Connecticut, Merrimac, and Androscoggin rivers. The rocks are ancient metamorphic, with naked granite and gneiss. There are five "notches," or passages through the mountains: the White Mountain notch, through which the Saco river passes; the Franconian notch, which permits the passage of the Pemigewasset; the Pinkham notch, and the Grafton and Dixville notches, through which flows the Androscoggin. A carriage road has been constructed to the summit of Mount Washington on the E. side, and a railroad on the W. side, the latter completed in 1869. The White Mountains were first visited by white men in 1642, but no settlements were made in the region till about 1771. Since 1868 the mountains have been

explored by the New Hampshire Geological Survey. There is a meteorological station on the summit of Mount Washington.

**White-necked Otary,** the *Otaria albicollis* (*Neophoca lobata*, Gray), from Australia. Adult males from eight to nine feet long, and larger specimens are said to occur. Face, neck, under surface, back, and sides blackish-brown, passing into slaty-gray on the extremities; hinder half of the crown, nape, and back of neck rich fawn. Called also Australian sea lion, Gray's Australian hair seal, and, from the peculiar light color on the head, cowled and counsellor seal.

**White Oak,** a species of oak, the *Quercus alba*, a native of the United States of America and of parts of Canada.

**White Pass,** a pass over the coast range of Alaska, about 10 miles S. of Chilkoot Pass. It was first regularly used in 1897 by travelers to the Klondike gold regions. A wagon road was constructed over it in 1898, and a railroad has been planned across it. The altitude of the pass is about 3,500 feet.

**White Pine,** the *Pinus Strobus*, one of the most valuable and interesting species of pines, common to Canada and the N. parts of the United States.

**White Plains,** a town in Westchester co., N. Y.; 26 miles N. N. E. of New York city. It was the scene of several important events during the Revolutionary War, the most prominent of which was the action usually known as the battle of White Plains, though it actually occurred in the town of Greenburg, on the opposite side of the Bronx river, Oct. 28, 1776. After a warm contest, the commanding eminence of Chatterton Hill, on which the Americans under Washington were intrenched, was carried by the British under General Howe, the Americans retreating in good order and without being pursued. The loss on each side was about 300 killed, wounded, and prisoners. Pop. (1900) 7,869; (1910) 15,949.

**White Pigments,** a variety of pigments of which the most important is white lead, which not only is very serviceable when used alone as a white color, but in oil painting most other colors are mixed with it to give them body. Commercial white lead is frequently mixed with sulphate of baryto (barium sulphate), but manufacturers of white lead object to this being called an adulteration, as the mixture is sold by them as such. Less common adulterations are gypsum, chalk, and china clay. Flake white is a pure white lead specially prepared for artists, and keeps its color better than the kind commonly used by house painters. Zinc white, or oxide of zinc, is not so much used for artistic work in oil as flake white, but in house painting it is often coated over a ground of white lead, zinc white not being liable to change by the action of sulphuretted hydrogen. As an oil color it wants body, and is a bad dryer. As a water color, under the name of Chinese white, it is very useful and permanent. Baryta white or permanent white, is the sulphate of baryta, and is best when artificially prepared. This pigment does not change in impure air, but is not much in favor for oil painting, except to mix for some purposes with white lead, as it renders it less liable to alter in tint. White pigments are numerous, but these three are by far the most important.

**White Precipitate,** $(NH_2H'')Cl$; ammonio-chloride of mercury; discovered by Raymond Lully in the 13th century, and obtained by adding ammonia to a solution of corrosive sublimate (mercuric chloride). It is a heavy white powder, inodorous, but possessing a metallic taste; insoluble in water, alcohol, and ether, and easily decomposed by heat. It is a violent poison, but is used in pharmacy in the form of an ointment as a stimulating application in chronic skin diseases, and for the destruction of lice.

**White Quakers,** the name given to those Quakers who seceded from the Irish body about 1840, from their habit of dressing in white. They form a small community, chiefly confined to Dublin. Blunt says they are "Antinomians of the worst description."

**White Ribbon Gospel Army,** a religious sect or Christian society giving special attention to moral purity. They first registered places of worship in England in 1884, and have since extended to the United States.

**White River.** (1) A river of Arkansas, with a course of 800 miles. It joins the Mississippi above the influx of the Arkansas river, and has several important affluents. Together with its tributaries it affords 500 miles of boat navigation. (2) A river in Indiana, formed by the confluence of the East and West Forks, emptying into the Wabash near Mount Carmel. (3) A river of Canada, an affluent of the Yukon. It rises in the coast mountains near the head of Altsekh river; flows for over 200 miles through a rough country in a N. W. direction; and enters the Yukon just above the mouth of the Stewart. Some gold has been found along its course.

**White Russia,** a name given by the people to that part of Russia lying toward the W. and principally inhabited by White Russians.

**White Sea,** a branch of the Arctic Ocean which extends S. W. into the province of Archangel as far as the 64th parallel. It is separated from the open sea by the peninsula of Kola and a strait 246 miles long, and from 106 miles (between Capes Sviatoi and Kanin) to 28 wide, and divides itself

for the most part into three bays, of which the broadest is the Dwina Bay to the S. E., the S. the Onega Bay, and the longest the Kandalak Bay in the W. Its area, including the N. E. bay, into which the Mezen falls, is 47,346 square miles. The coasts are flat, with numerous lakes, small rivers, and mountains in the N. and E. The White Sea is blocked with ice except during the months of June, July, and August. Canals connect it with the Volga and the Dnieper. The dwellers on its shores are Lapps, Finns, and Samoyedes, who live by fishing, seal hunting, and the chase. The chief port is Archangel. The passage to the White Sea was discovered in 1553 by Richard Chancellor, an officer under Sir Hugh Willoughby. The English in 1584 established the little fort of Archangel as the center of the White Sea trade, in which they enjoyed great privileges till the founding of St. Petersburg.

**White Shark,** in ichthyology, the *Carcharias vulgaris,* one of the largest and most formidable of the family. It is a native of tropical and sub-tropical seas, and has occasionally strayed to the British coast. Specimens have been known to attain a length of 30 feet; ashen-brown above, white below.

**White Sheep,** an appellation given to the Turkomans who conqured Persia about 1468, but were expelled in 1501. Named from their having a white sheep on their banner.

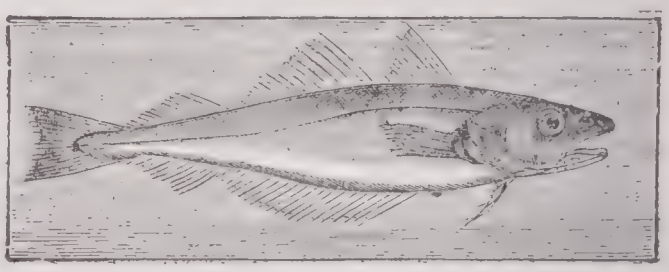
**White Stoned, The,** Moscow, in allusion to the ramparts around the old city, which are of a snowy-white limestone.

**White Swelling,** the popular name for all severe diseases of the joints resulting from chronic inflammation in the bones, cartilages, or membranes constituting the joint. Among the diseases known under this name are: (*a*) acute or chronic inflammation of the synovial membrane; (*b*) pulpy thickening of the synovial membrane; (*c*) ulceration of the cartilages; (*d*) scrofulous diseases of the joints beginning in the bones. They may arise as effects of phlebitis, gout, rheumatism, syphilis, scrofula, or mercury. The knee, ankle, wrist, and elbow are the joints most subject to white swellings.

**Whitethroat,** in ornithology, the popular name of two species of Old World warblers; *Curruca cinerea,* the greater, and *C. sylviella,* the lesser whitethroat. Length of the first species rather more than five inches; plumage various shades of brown, breast and belly brownish-white, tinged with rose color in the male. It feeds on berries and insects, and makes an excellent cage bird, as the song is sweet and lively. The lesser whitethroat is rather smaller. Plumage on upper surface shades of brownish-gray; under surface white, with yellowish-red on breast. Also, a popular name for any species of Leucochloris; a genus of humming birds, with one species (*Leucochloris albicollis*), from Brazil. Tail rounded; bill longer than the head and somewhat curved; tarsi clothed.

**Whitewash,** slaked quicklime, reduced to the consistency of milk by means of water. It is used for coloring walls, and as a disinfectant. If merely for coloring, a little size is added, but not when used for sanitary purposes.

**Whiting,** fine chalk pulverized and freed from all impurities by elutriation. It is used in whitewashing, distemper, painting, cleaning plate, etc. In ichthyology, the *Gadus merlangus,* usually from 12 to 16 inches long, and from a pound to a pound and a half in weight, though far larger specimens have been taken. Dusky yellow on the back, sides paler, belly silvery white. The whiting is met with on all the coasts of Northern Europe, and is caught in great numbers with hook and line. The fish derives its English name from the pearly whiteness of its flesh, which is highly esteemed, and large quantities of which are salted and dried. Couch's whiting is less common. It is more slender than the common whiting, and the upper jaw is a little longer than the lower.



WHITING.

**Whiting, Henry,** an American military officer; born in Lancaster, Mass., in 1790. He served with credit in many grades, and retired with the rank of brevet Brigadier-General. His published works include: "Otway: A Poem" (1822); "Sannillac: A Poem" (1831); "The Age of Steam"; "Life of Zebulon Montgomery Pike." He was co-author of "Historical and Scientific Sketches of Michigan" (1834), and edited "Washington's Revolutionary Orders," selected from the MSS. of John Whiting, his father (1844). He died in St. Louis, Mo., Sept. 16, 1851.

**Whiting, Lilian,** an American author; born in Niagara Falls, N. Y., Oct. 3, 1857. She was literary editor of the Boston "Traveler" in 1880–1890, and editor of the Boston "Budget" in 1890–1894. She then traveled in Europe. Her publications include "The World Beautiful" (3 vols.); "From Dreamland Sent" (poems); "After Her Death"; "The Story of a Summer"; "A Study of the Life and Poetry of Elizabeth Barrett Browning"; "Kate Field: a

Record"; "The Spiritual Significance"; etc.

**Whiting Pout.** See Bib.

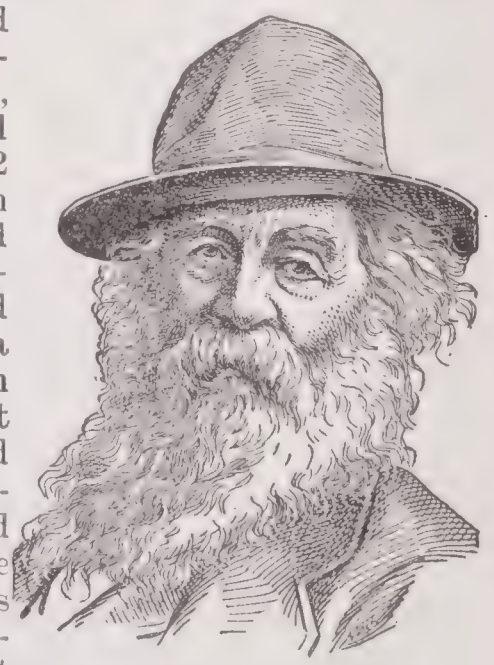
**Whitlow,** a very painful inflammation of one of the fingers, or sometimes, though very rarely, of the toes, and usually proceeding to suppuration. It is divided into four kinds, according to the depth of the inflammation, the most superficial taking place immediately under the skin, the deepest lying underneath the periosteum. In the more superficial cases the application of leeches and warm fomentations to the part will in general give relief, and sometimes cause the resolution of the inflammation. Where any matter is formed, as is generally the case, it requires to be discharged with the point of the lancet, when the disease usually subsides. When seated in the sheath of the tendons, the symptoms are much more urgent, and the pain most excruciating, and of a throbbing character, extending up the arm even to the shoulders. It is much aggravated by the finger being in a dependent position, and usually there is a considerable degree of fever, and the patient suffers from want of rest. With all this pain there is but little redness or swelling, and even when matter is formed, it may not be perceptible from being deep-seated.

Leeches, warm fomentations, and poultices should be used in the early stages; but should this prove ineffectual, a free incision should be made down through the sheaths of the tendons, which usually affords relief, a small quantity of pus being discharged, and the disease subsiding in a few days by the use of warm fomentations and poultices. Sometimes the inflammation will extend into the palm of the hand and forearm, forming abscesses and sloughing, in which case free incisions will require to be made into the different inflamed parts to give exit to the matter and sloughs, and poultices afterward applied. Occasionally the use of the forearm and hand may be lost, and not unfrequently amputation may be required. The remarks also apply to those cases in which the periosteum, or membrane covering the bone, is affected. Frequently, as the disease advances, the bone itself becomes affected with caries, and early and deep incisions are required down to the bone.

**Whitman, Marcus,** an American pioneer; born in Rushville, N. Y., Sept. 4, 1802. In 1836 he emigrated with a number of others to work as a missionary among the Indians of the Upper Columbia. Accompanied by his young wife he crossed the plains by wagon, being the first person to reach the Pacific by this means. He was soon followed by a large number of emigrants who settled in what was then known as Oregon, and which now forms the States of Oregon, Washington, and Idaho. At this time the Hudson Bay Company were using every possible means to secure this territory to the English. When this plan became evident to Dr. Whitman he decided to take every precaution to forestall it. The Ashburton-Webster treaty was then before Congress and was expected to settle the Oregon question. Knowing that the government should have full information as to the true state of affairs, Whitman rode over 3,000 miles on horseback, enduring all the hardships of a Western winter in the mountains, and reached Washington on March 3, 1843, only to find that the treaty had been signed. Fortunately the Oregon question had not been included. Dr. Whitman at once went to work and taught the government the value of the land it had deemed worthless, demonstrated to the people the fertility of the soil of Oregon, and the fact that it could be reached by wagon, and then returned at the head of 1,000 emigrants. By his daring ride and his earnest endeavors Dr. Whitman won this great section for the United States, and the results of his work were secured by the treaty of 1846. In 1847, with his wife and some others, he was massacred by the Cayuse Indians.

**Whitman, Sarah Helen Power,** an American poet; born in Providence, R. I., in 1803. She married John W. Whitman, a Boston lawyer; was once engaged to Edgar Allan Poe, afterward writing a defense of him entitled "Edgar A. Poe and his Critics" (1860); and was noted for her conversational powers. She published several volumes of poems, among them being the volume "Hours of Life, and Other Poems" (1853); also "Fairy Ballads," written with her sister, Anna M. Power. She died in Providence, R. I., June 27, 1878.

**Whitman, Walt,** an American poet; born in West Hills, Long Island, N. Y., May 31, 1819. Like many another man of genius Whitman seems to have owed little to his formal education, as he left school at the age of 12 to serve first in a lawyer's and then in a doctor's office, and finally in a printer's as an apprentice. But that he profited by such schooling as he had is shown by the fact that his next employment was that of itinerant teacher in country schools. He returned shortly to his printing, with spells of summer holiday



WALT WHITMAN.

and even farm work, and in 1846 became editor of the Brooklyn "Eagle." This and his other numerous press engagements were only of short duration, a certain restlessness, love of wandering, and eagerness for fresh experiences making him pass rapidly from one post or employment to another. He even built and sold houses at one time. All along haunted by the yearning and sense of obligation to produce a life work, Whitman seemed quite unable to find full and free expressions for his emotions and thought till he hit upon the curious, irregular, recitative measures in which he composed the "Leaves of Grass." When first issued in 1855 this unique publication was but a small quarto of 94 pages, but it grew in the course of the seven succeeding editions till it contained nearly 400 pages. The later and complete editions, taken together with his prose book "Specimen Days and Collect," may be held to embrace the life work of Whitman as a writer.

But Whitman least of all men was content with an idle and remote spectatorship of life; he was ever bold and determined to face and grapple with life's saddest and sternest realities, to put the full strength of his shoulder to the burden of his fellows. Thus it came that summoned to tend his own brother, wounded in the Civil War, he became the brother-nurse to every wounded or sick man in the Union army. Not Florence Nightingale's self could be more tender and more beloved than the stalwart bearded Walt, passing like a broad sunbeam from bedside to bedside in the long hospital wards, with cheery words and helpful offices to the living and last hand-clasps and brotherly kiss to dying comrades. The exertion, the exposure, and the high nervous and emotional strain Whitman underwent in these few years left him a shattered and almost aged man. About the close of the war he received a subordinate clerkship under the government, and was summarily dismissed by Secretary Harlan as the author of "an indecent book"; though he fortunately obtained a similar post almost immediately. In 1874 he left Washington for Camden, N. J., where he lived till his death. Partially paralyzed as he now was, Whitman was in no small danger of falling into absolute poverty, had it not been for the timely help of his admirers beyond the Atlantic, a movement in which Tennyson, Carlyle, and Ruskin and other leading authors took generous and active part. Later on several wealthy American citizens honored themselves and their country by liberally providing for the aged poet's simple wants.

All the auspices seem in favor of Whitman's immortality: the neglect of his own countrymen, tempered only by ridicule, abuse, and even persecution; the recognition by a few of the leading minds of Europe and the United States; his slow emergence into acceptance and appreciation if not into popularity; all these seem auguries of a true man of genius. Though Whitman, like Carlyle and Browning, may be a dangerous and dangerously easy model for disciples to imitate, he undoubtedly worked out for himself a style of distinction as notable as theirs. This in itself is a title to fame, or at least a charm against oblivion, even though his style, like that of Lyly, runs to extremes and vices. This style or form is a sort of rhythmic recitative or irregular chant, the precursors of which may be found in the English translation of the Psalms and other Biblical poems, in Macpherson's "Ossian," and in the later poems of William Blake. These chants vary in movement and seem governed by laws rhythmic rather than metric, which (like the grammar of an unwritten tongue) have never been formulated even by the inventor himself. They have a peculiar, wild, stirring charm, which is apt to make regular verses seem tame and insipid after them. As to subject, Whitman set himself the Atlantean task of uplifting into the sphere or dominion of poetry the whole of modern life and man, omitting nothing, concealing nothing. Like Wadsworth, he would sing "man as man," only with a far wider and bolder sweep of subject and greater daring of treatment. His thesis is that of St. Peter's vision; "there is nothing common or unclean." Hence the logical necessity with Whitman to include the treatment of subjects which in modern society were tabooed as obscene and unmentionable; hence too the accusations of indecency, so just and pertinent from the accuser's point of view, so futile and irrelevant from that of the accused. Whitman is in fact an idealist who has bound himself by a solemn vow to be a thorough-going realist; and it is his resolute and often successful endeavor to secure this union that gives his work its exceptional artistic quality.

He is a prince of impressionists in literature. But so high and hard is the task that Whitman sets himself that it is no matter of surprise that he sometimes, if not often, fails, and from heights where he was approaching the sublime falls perilously near the ridiculous. It is the fate of all artists who strive for the highest things that their failures — often only apparent — are more easily detected than their solid achievements; hence the contumely and ridicule that a Turner or a Wordsworth, Keats, or Landor, or Shelley suffers at the hands of a clever but uninitiated criticism. So largely with Whitman; but it is better to approach him in the same spirit that he has shown toward man and nature, that of for ever seeking for what is great and good, while outfacing steadily and bravely every stern and refrac-

tory reality. He died in Camden, N. J., March 26, 1892.

**Whitman College,** a coeducational institution in Walla Walla, Wash.; opened in 1866 under the auspices of the Congregational Church; has productive funds exceeding $270,000; grounds and buildings valued at over $250,000; scientific apparatus, etc., $15,000; volumes in the library, about 17,000; average number of faculty, 48; average student attendance, 415.

**Whitney, Adeline Dutton (Train),** an American author; born in Boston, Mass., Sept. 15, 1824. Besides writing a great deal for magazines, she published: "Footsteps on the Seas: A Poem" (1857); "Mother Goose for Grown Folks" (1860; revised ed. 1882); "The Boys at Chequasset" (1862); "Faith Gartney's Girlhood" (1863); "The Gayworthies: A Story of Threads and Thrums" (1865); "A Summer in Leslie Goldthwaite's Life" (1866); "Patience Strong's Outings" (1868); "Hitherto: A Story of Yesterdays" (1869); "Real Folks" (1872); "Pansies" (1872), verse; "The Other Girls" (1873); "Sights and Insights" (1876); "Bonnyborough" (1885); "Homespun Yarns" (1887); and two volumes of poems, "Bird Talk" (1887) and "Daffodils" (1887); "Square Pegs," etc. She died March 20, 1906.

**Whitney, Eli,** an American inventor; born in Westboro, Mass., Dec. 8, 1765; was graduated at Yale College, in 1792, where he paid his expenses partly by school teaching, partly by mechanical labor. He went to Georgia as a teacher, but finding a generous patron in the widow of General Greene, of the Revolutionary army, he resided on her estate and studied law. The cotton culture at this period, especially that of the best kind, the "green seed," was limited by the slow and difficult work of separating the cotton from the seed by hand. Whitney set to work to remedy this under great disadvantages, for he had to make his own tools; but the reports of his success prompted some lawless people to break into his workshop and steal his machine, and get others made before he could secure a patent. He, however, formed a partnership with one Miller in 1793, and went to Connecticut to manufacture cotton gins; but the lawsuits in defense of his rights carried off all his profits and $50,000 voted him by the State of South Carolina. Finally in 1798 he got a government contract for the manufacture of firearms, and was the first to effect the division of labor by which each part was made separately. He made a fortune by this manufacture, carried out with ingenious machinery at Whitneyville, Conn.; while he received little credit for the perfection of the gin, one of the most important of the whole series of inventions connected with the cotton manufacture. He died in New Haven, Conn., Jan. 8, 1825.

**Whitney, Henry Howard,** an American military officer; born in Glen Hope, Pa., Dec. 25, 1866; was graduated at the United States Military Academy and commissioned lieutenant 4th United States Artillery in 1890. He was on special duty at the War Department from April 1, 1896 till April 11, 1898, when he was detailed as military attache to the United States legation at Buenos Ayres, Argentine Republic. Under orders of the Secretary of War, and disguised as an English sailor, he communicated with General Gomez and made military reconnaissance of the island of Porto Rico, and so furnished information which was the basis of the campaign on that island under General Miles. He served throughout the American-Spanish War on General Miles' staff as captain and assistant-adjutant-general.

**Whitney, Josiah Dwight,** an American geologist; born in Northampton, Mass., Nov. 23, 1819; was graduated at Yale in 1839, and the year after joined the survey of New Hampshire. The years 1842–1847 he spent in study in Europe, returning to explore, together with J. W. Foster, the Lake Superior region. Their "Synopsis" of the explorations was published in 1849; their "Report" on the geology, 1850–1851. Whitney next spent two years traveling in the States E. of the Mississippi, of which the fruit was "The Metallic Wealth of the United States" (1854). Appointed State chemist and professor in the Iowa State University in 1855, together with James Hall, he issued the "Reports" on its geological survey (1858–1859); and in 1858–1860 took part in the survey of the lead region of the Upper Missouri, publishing, again with Hall, his "Report" (1862). He was appointed State Geologist of California in 1860, and labored on the survey of that State till 1874, publishing in six volumes his "Geological Survey of California" (1864–1870). In 1865 he was appointed to the chair of geology at Harvard, received the LL. D. degree from Yale in 1870, and had the honor of giving his name to one of the highest mountains in the United States. His "Yosemite Guidebook" was published at San Francisco in 1869; his "Contributions to American Geology" in 1880; and his "Studies in Geographical and Topographical Nomenclature," in 1888. He died at Lake Sunapee, N. H., Aug. 18, 1896.

**Whitney, William Collins,** an American capitalist; born in Conway, Mass., July 15, 1841; was graduated at Yale College in 1863, and at the Harvard Law School in 1865; studied law with Judge Abraham R. Lawrence in New York city, and was there admitted to the bar. He took an active part in the proceedings against the "Tweed

Ring"; served as corporation counsel in 1875–1882; and was Secretary of the Navy in 1885–1889. He then engaged in large financial operations in New York city and elsewhere. He died Feb. 2, 1904.

**Whitney, William Dwight,** an American educator; born in Northampton, Mass., Feb. 9, 1827; was graduated at Williams College in 1845; spent some years abroad in study; in 1854 was made Professor of Sanskrit at Yale, in 1870 of comparative philology, holding both positions till death. His writings are authority on all philological questions, and his rank as a Sanskrit scholar is of the first order. From 1849 he was a member of the American Oriental Society, and its president from 1884. His contributions to the "North American Review," the "New Englander," and other periodicals, were numerous and varied. His earliest work was the preparation, in company with Rudolf Roth of Tübingen, of an edition of the "Atharva Veda Sanhita" (Berlin, 1856). Among his other works are: "Language and the Study of Language" (1867); "On Material and Form in Language" (1872); "Darwinism and Language" (1874); "Logical Consistency in Views of Language" (1880); "Mixture in Language" (1881); "The Study of Hindoo Grammar and the Study of Sanskrit" (1884); "The Upanishads and their Latest Translation" (1886). He has also written: "Compendious German Grammar" (1869); "German Reader in Prose and Verse" (1870); "Essentials of English Grammar" (1877); "Sanskrit Grammar" (1877); and "Practical French Grammar" (1886). Professor Whitney was the superintending editor of the "Century Dictionary" (1889–1891), and assisted in the preparation of "Webster's Dictionary" (1864). He died in New Haven, Conn., June 7, 1894.

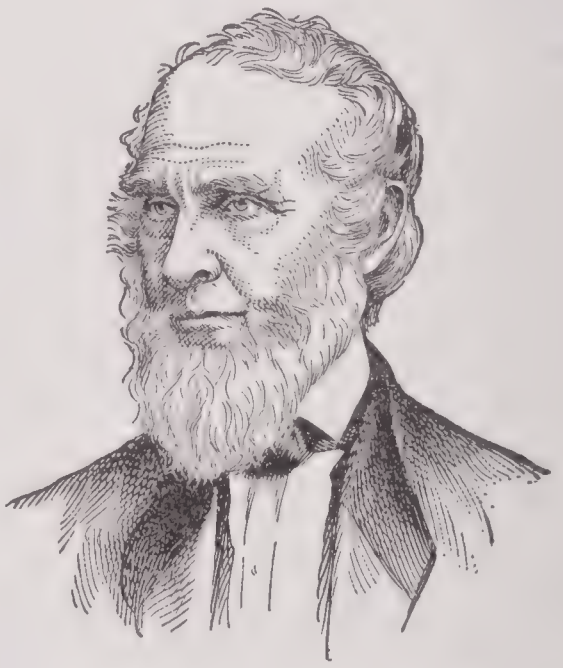
**Whitney, Mount,** one of the highest mountains of the United States; in the Sierra Nevada in Southern California; height, 14,898 feet.

**Whitside, Samuel Marmaduke,** an American military officer; born in Toronto, Canada, Jan. 9, 1839; entered the United States army in 1858; served with the 6th United States Cavalry through the Civil War; and was afterward engaged for more than 25 years in the Indian wars on the Western frontier, where he captured Big Foot and his 400 Sioux warriors in December, 1890; and commanded his regiment at the battle of Wounded Knee on the following day. He was in command of the 5th United States Cavalry during the American-Spanish War; and in October, 1898, took command of the 10th Cavalry and accompanied that regiment to Cuba in May, 1899, where he was placed at the head of the Department of Santiago and Puerto Principe in January, 1900. He was promoted Brigadier-General in 1901.

**Whitsunday,** the seventh Sunday after Easter; a festival of the Church in commemoration of the descent of the Holy Spirit on the day of Pentecost. The name was derived from the white garments worn on that day by candidates for ordination and children presented for baptism. The older name was PENTECOST (*q. v.*). In Scotland, it is the name given to one of the term days (May 15, or May 26, old style), in which rents, annuities, ministers' stipends, etc., are paid, servants are engaged and paid, and the like. The Whitsunday removal term in the towns is now legally fixed for May 28.

**Whittemore, Thomas,** an American clergyman; born in Boston, Jan. 1, 1800. He was joint editor of the "Universalist Magazine," sole editor and proprietor of the "Trumpet" (1828–1857); member repeatedly of the Massachusetts Legislature; and president of the Vermont and Massachusetts railroad. He wrote: "Modern History of Universalism" (enlarged ed. 1860); "Autobiography" (1859), besides commentaries, hymns, biographies, etc. He died in Cambridge, March 21, 1861.

**Whittier, John Greenleaf,** an American poet; born near Haverhill, Mass., Dec. 17, 1807. The son of a poor farmer, who was also shoemaker, young Whittier obtained his formal education only with that struggle which seems so much better to foster genius than the possession of all the advantages, as they are called. While the bodily frame that so well served him till his peaceful decease was developed and hardened by his healthy, if arduous outdoor life, his observation was roused and quickened, his imagination fired and colored by the shining pages of nature's volume spread out



JOHN GREENLEAF WHITTIER.

continually before him. He wandered the New England meadows with the voices of Burns and Wordsworth forever in his ears. He had, too, a notable schoolmaster in Joseph Coffin, an enthusiastic collector of all local legends and antiquities, thus adding to wild nature and weirder interest of strange dark, and thrilling human deeds and dread-born superstitions. For his technical education Whittier was apprenticed to journalism, beginning with contributions to the "Poet's Corner" and as early as 1829 undertaking the editorship of the "American Manufacturer"; and in 1830 that of the "New England Weekly Review," published in Hartford, Conn. His next move was a return to his native town to a similar post on the Haverhill "Gazette" in 1832, after having published in the previous year "Legends of New England" and "Moll Pitcher."

Long before this his poetry had attracted the admiration of William Lloyd Garrison, who rode over from Newburyport to see Whittier when quite a lad, and became his life-long friend. So it fell out that, if Garrison may be called the preacher or prophet, Whittier must be wreathed the poet laureate of abolition (even though Emerson touched the subject with more puissant pen). Thenceforward, whether with the bright flashing blade of his noble poetic rhetoric or the sounding quarter-staff of his earnest and manly prose, he fought the long, hot, dangerous battle of emancipation through contempt and defeat to lasting and complete victory. Apart from this strenuous and heroic struggle there is nothing epoch making in Whittier's life literary or personal. In 1840 he settled in the quiet of Amesbury, a village near his birthplace.

Of Whittier's collected prose works it may be said generally that the historical interest is stronger than the literary; for his prose never rises to the high levels of his poetry, and its main interest lies in the fact that in it we have the work, we may almost say the life work, of a very earnest and excellent man. The contents of these volumes consist chiefly of articles which have long since served their purpose; and as permanent contributions to literature they lack the masterly style which has in some instances rendered immortal what would otherwise be of but transient interest. Beyond the Atlantic the name abolitionist has never probably obtained the credit that was due to it, mainly because it was hard for an Englishman to realize the high moral and physical courage which the man or the woman must have who passed by that name, not in the slave States merely, but in the North itself, fated though the North was to fight and bleed and conquer in that very cause.

Whittier's claim to immortality lies clearly in his poetry, and there in very small bulk. His anti-slavery poems have for the most part served their purpose, and with some few exceptions, such as the pathetic and spirited "Slaves of Martinique," can hardly be of enduring interest. His nature poetry is faithful, fresh, and beautiful, without being quite original, and his ballads of moral heroism, "Barclay of Ury" and "Barbara Frietchie," if a little wanting in pith and sustained force, rank high among poems of that class; but it is when he soars into the spiritual and even mystic spheres, as in "My Psalm," that, rising lark-like, his notes come clearest, sweetest, and truest. At lower levels his note is often less certain or even is often ill sustained. Concerned rather with the feelings and thoughts (neither of them very remarkable) which he desires to express than with poetic form, he lacks the true enthusiasm of the artist for the technique of his work; hence blemishes are often only too patent. Whittier had not, in fact, the quality of originality of the first order nor of that expansiveness which itself becomes the equivalent of originality. No man could be more faithful to his principles, more true to his conscience, and more single in his aspirations toward what was right; no man could cherish through a long life a faith more simple and exalted, or declare with more clearness and insistence his high spiritual message. All these things make a man good and great; they leave him with a lasting influence over kindred minds; but they alone will hardly secure him immortality as a great writer or cause him to take rank among the real thinkers of his age. What will longest remain to us will be the record of a long, pure, and blameless life, and a few of his poems in which, as by a rare and happy fortune, the outbreathings of a sweet and exalted spirit have come to us in a form as exalted and as sweet. He died in Hampton Falls, N. H., Sept. 7, 1892.

**Whittington, Richard,** an English magistrate; born in Pauntley, England, about 1350; youngest son of Sir William Whittington. His father dying, Richard set out for London at 13 to push his fortune, and apprenticed himself to Sir John Fitz-Warren, a prosperous mercer, whose daughter he afterward married. He was a member of the Mercer's Company in 1392, the year after an alderman and sheriff. In 1397 he was chosen mayor of London to fill the place of Adam Bamme who had died in his year of office, again in 1406, member of Parliament for the city in 1416, and in 1419 for the third time mayor. He was knighted by Henry V., and died in the spring of 1423, and by his will rebuilt Newgate and St. Michael's Church, connecting also a college and an almshouse with it, while he also restored St. Bartholomew's Hospital, gave a library to Grey Friars, and

provided drinking fountains. The popular cat story attributed to him is not well authenticated.

**Whitworth, Sir Joseph,** an English engineer; born in Stockport, England, in 1803. After working as a journeyman in Manchester and London, he started business in the former city in 1833 as a manufacturer of engineers' tools, thus founding the firm of which he was long the head. He subsequently turned his attention to a uniform system of screw threads, which was soon very generally adopted. This was followed by standard gauges, which have been universally accepted for engineering work. In 1854–1855 he began his experiments with firearms, which led to the production of the Whitworth rifle, and later brought him into competition with Armstrong as a manufacturer of rifled ordnance. He was also the originator of the fluid-pressed steel, used in the manufacture of cannon and ships' plates. He was created a baronet in 1869. The Whitworth scholarships were founded by him in 1869. He was the author of "Guns and Steel" (1873), and "Essays on Mechanical Subjects" (1882). He died in Monte Carlo, Italy, Jan. 22, 1887.

**Whitworth Gun,** in ordnance, a wrought iron or, afterward, steel gun invented by Sir Joseph Whitworth. It had a hexagonal spiral bore, the angles of which were rounded off, and fired a projectile (sometimes called the Whitworth ball), the middle part of which fitted the bore, but the rear part tapered somewhat, and did not touch the rifling, while the point was rounded. Both muzzle-loading and breech-loading patterns were made. There was very little windage, and good ranges were obtained.

**Whitworth Scholarships,** certain scholarships established in 1869 by Sir Joseph Whitworth, to encourage the cultivation of combined theoretical and practical skill in the industrial arts of mechanics and engineering. They were placed by the founder under the charge of the English Council of Education, and are open to be competed for by any young man not 26, and who has been engaged in handicraft in the workshop of a mechanical engineer for at least three years. There are now four scholarships annually competed for of the value of $625, tenable for three years, besides exhibitions tenable for one year, value $250 and $500.

**Whorl,** in botany, a ring of organs all on the same plane.

**Whortleberry,** a genus of small shrubs, of the natural order *Vaccinaceæ,* having a four to five-toothed calyx, a four to five-cleft bell-shaped or urceolate corolla, with the limb bent back, 8 or 10 stamens, with two-horned anthers, and a four to five-celled many-seeded berry. The species are numerous, mostly natives of the northern parts of the world, with evergreen or deciduous, more or less ovate leaves. The common whortleberry, or billberry (*V. myrtillus*), called in Scotland the blaeberry, is very common in Great Britain, and in the middle and N. of Europe. It is found also in Iceland and in the N. regions of North America. It varies from a few inches to almost two feet in height, and has ovate deciduous leaves, and dark purple berries, covered with a mealy bloom. A variety occurs, but rarely, with white berries. The berries are very sweet and agreeable, and are much used for making jelly and tarts; they are also eaten in Devonshire raw with clotted cream. The juice of the berries mixed with the powdered bark of alder and alum is employed by the women of Northern Russia to dye their hair bright red. A kind of spirituous liquor is also made from them in Germany. The bog whortleberry, or great billberry (*V. uliginosum*), is common in the N. parts of Great Britain, and in the N. of Europe and Asia. It is said to cover extensive tracts in Greenland. It grows in marshy situations, and is a taller plant than the common whortleberry. It has deciduous, obovate, entire leaves, and a fruit larger than the common whortleberry, and inferior to it in flavor. The fruit is said to cause giddiness when eaten in large quantity, and an intoxicating liquor is made from it. The red whortleberry (*V. vitis-idæa*) is found on the dry barren moors of Scotland (where it is called cranberry), in Northern Europe, and the United States. The berries, dark red in color, are acid, somewhat austere, and not so agreeable as the billberry; yet they make an excellent jelly, which is esteemed for sore throats, and is much used by the Swedes as an accompaniment to venison and other roast meats. Many species of *Vaccinium* are in occasional cultivation as ornamental shrubs, and the fruit of most of them is agreeable, although in general it wants acidity. Huckleberry, a name of the gaylussacia shrubs of North America, is sometimes given to the whortleberry, as is also cowberry.

**Whydah Bird,** or **Widow Bird,** the common name of the genus *Vidua,* family *Icteridæ,* comprising beautiful birds, inhabiting Western Africa, and particularly abundant in the country of Whydah, whence their name, of which widow is a mere corruption. The body of the whydah bird is generally about the size of a canary bird, but the male is remarkable for an astonishing development of plumage during the breeding season, after which its splendid tail drops off, and the sexes are then barely distinguishable. There are several species, one of which, *Vidua paradisea,* will be sufficient to describe. The upper part of the plumage is of a faded or deep brownish-

black; but this color becomes of a paler hue on the wings and lateral tail feathers. The head, chin, and throat are of this faded black, which extends downward, narrowing as it descends, to the middle of the breast. A broad, rich, orange, rufous color proceeds from the upper part of the back of the neck, and unites with a tinge of the same color on the sides of the neck and breast; this last hue passes into the pale buff of the body, but leaves the under tail covers black, like the upper ones.

**Whymper, Edward,** an English traveler; born in London, England, April 27, 1840. He was famous as a mountain climber; was the first to ascend the Matterhorn and other great Alpine peaks; ascended several of the greatest of the Andes; and traveled in Greenland. He published, and himself illustrated, "Swiss Pictures" (1866); "Scrambles among the Alps" (1869); "Travels among the Great Andes of the Equator" (1892); etc.

**Whymper, Frederick,** an English writer of travels; born in London, England, July 20, 1838; brother of Edward. He wrote: "Travels and Adventures in Alaska" (1869);, and "Heroes of the Arctic and their Adventures" (1875); and compiled "The Sea: Its Stirring Story of Adventure, Peril, and Heroism" (4 vols. 1878–1881).

**Whyte-Melville, George John,** an English novelist; born near St. Andrews, Scotland, in 1821. A captain in the Coldstream Guards, he retired from the army, in 1849, but served in the Turkish cavalry during the Crimean War. Among his works were: "Captain Digby Grand" (1853); "The Gladiators" (1863); "Sarchedon" (1871); "Katerfelto" (1875); etc. He wrote also a volume of "Songs and Verses" and translated Horace's Odes; "Zermatt and the Matterhorn" (1897); etc. He died Dec. 5, 1878.

**Wiard, Norman,** an American inventor; born in Normandale, Ontario, Canada, in 1826; was early employed as a foreman in a foundry in Bradford, Ontario, and there began the series of experiments in founding ordnance that afterward gave him his world-wide distinction. During the Civil War he was employed by the United States government in the manufacture of ordnance and projectiles, and was frequently called into consultation by the President and Secretary Stanton. After the war he applied himself to experiments and inventions in his special lines; patented a device for preventing the explosion of steam boilers, which he sold to the United States and Japanese governments; spent two years in Japan in the government employ; was for some time a military engineer in that country; and on his return to the United States conducted a series of experiments in gunnery near Boston, Mass., which attracted wide attention. He died in Reading, Pa., Sept. 11, 1896.

**Wichita,** a city and county-seat of Sedgwick co., Kan.; on the left bank of the Arkansas river, and on the Atchison, Topeka, and Santa Fé, the Missouri and Pacific, the Wichita and Western, the St. Louis and San Francisco, and the Chicago, Rock Island, and Pacific railroads; 160 miles S. W. of Topeka. Here are Fairmount College, Wichita University, business colleges, All Hallows and Lewis Academies, public library, St. Francis and Wichita Hospitals, city hall, court house, United States government building, national and State banks, street railroad and electric light plants, waterworks, and several daily, weekly, and monthly periodicals. According to the census of 1900 there were 328 manufacturing establishments, employing 1,505 persons; paying $639,271 for wages and $3,060,661 for materials; and having a combined output valued at $4,724,068. The principal manufactures are flour, glass, woolen goods, carriages, etc. Near the city is a productive vineyard, and gas, lime, and oil are found in the vicinity. The assessed property valuation exceeds $5,500,000. Pop. (1900) 24,671; (1910) 52,450.

**Wichern, Johann Heinrich,** a German philanthropist; born in Hamburg, Germany, April 21, 1808; studied first at the Johanneum of that city, then as a student of theology at Göttingen and Berlin, received a benefice in his native town, and gave himself up to practical endeavors to improve the condition of the poor, the suffering, and the lost. In the Rauhes Haus (founded Nov. 1, 1833) he established an institution for neglected children, with which a training seminary for teachers was also joined. Institutions on a similar plan were shortly afterward formed throughout Germany and in several other European countries. In September, 1848, he succeeded in forming a central union for the "Inner Mission," an association which converted into one regular system "the whole of the activity for the poor, the sick, the fallen, and those strange to religious and moral influences." In 1856 he was appointed councillor of the Prussian ministry of the interior, and a member of the higher church council. His writings were entirely of a practical character. He died in Hamburg, Germany, April 7, 1881.

**Wichert, Ernst Alexander August Georg,** a German dramatist; born in Insterburg, Germany, March 11, 1831. He wrote: "Our General York" (1858); "Light and Shade" (1861); "The Fool of Luck" (1869), which took the prize at the Vienna Burg Theater, and turned the public

attention to him; several novels, among them being "Behind the Scenes" (1872), "The Green Gate" (1875), "A Strong Heart" (1878); some historical works, as "Heinrich von Plauen" (1883) and "The Great Elector in Prussia" (1886); and many plays.

**Wichtine,** or **Wichtisite** (after Wichty, Wichtis, Finland, where found), a massive mineral with rectangular cleavages; hardness, above 6.0; sp. gr. 3.03; luster, dull; color, black; composition: A silicate of alumina, lime, iron, magnesia, etc. A doubtful species.

**Wickede, Julius von,** a German author; born in Mecklenburg, Germany, July 11, 1819. He wrote: "A History of the War between Germany and France in the Years 1870 and 1871" (1873); "A History of the Wars of France against Germany in the Last Two Centuries" (1874); "A Prussian Officer" (1873); "A German Trooper's Life" (1861); etc.

**Wick,** the county town of Caithness, Scotland; on the Wick river, at its entrance to Wick Bay; 161 miles N. N. E. of Inverness. The royal burgh, with its suburbs Louisburgh and Boathaven, lies N. of the river, and Pultneytown, a settlement (1808) of the British Fisheries Society, on the S. bank. The tidal harbor is a good erection, with accommodation for vessels of light draught and a large fleet of fishing boats; but a costly attempt to provide larger space with an increased depth of water, by building a new pier and other works farther out in the bay, has been but partially successful. Wick is one of the great centers of the herring fishery, and to this industry everything is subordinated. Cloth and furniture are also made in some quantity, and there is an extensive distillery and brewery in Pultneytown. Coal and salt are the chief imports, and salt herrings, oats, and live stock are exported. The shipping trade is considerable, and steamers call from Orkney, Thurso, Aberdeen, and Leith. There is some fine rock scenery in the neighborhood. Pop. (1901) 2,773.

**Wickersham, George Woodward,** an American lawyer; born in Pittsburg, Pa., Sept. 19, 1858; began law practice in Philadelphia in 1880; removed to New York city two years later; was employed as special and general counsel for several large railroad corporations till 1909, when he was appointed Attorney-General of the United States.

**Wickstrœmia,** or **Wikstromia,** (named after Wickstrœm, a Swedish botanist (1789-1856), a genus of *Thymelaceæ;* shrubs and small trees. Its bark is used eternally for wounds and internally for coughs. An inferior sort of paper and rope is made from *W. virgata* in Kumaon, in India.

**Widdin,** a town and fortress of Bulgaria, on the right bank of the Danube; opposite Kalafat; 18½ miles from the Servian frontier, and 130 miles E. S. E. of Belgrade. It is the seat of a Greek bishop, and has an important citadel greatly strengthened since 1853–1854, built on a low hill, and surrounded with a double circumvallation with four gates to the landside and five to the river. The difficulty of attacking the fortress is greatly increased by the flat, swampy character of the ground. There are in Widdin 1,730 bazaar booths, 3 barracks, and 2 hospitals. It manufactures gold and silver filigree and saddles, and has considerable fishery, and trade in rock salt, corn, wine, and agricultural products. The merchants are principally Jews and Bulgarians. Widdin is the Bononia of the Romans. In 1801 it was the scene of the defeat of the Hospodar Michael Sutsos by Paswan Oglu, and here in October, 1853, Omer Pasha began the hostilities against Russia by crossing the Danube and occupying Kalafat, whereafter ensued several battles in the neighborhood between the Turks and Russians, the chief on April 6 and 19, 1854. In the war of 1877–1878 Widdin was occupied by 10,000 Turks. Osman Pasha was commandant, and it was from Widdin he made his unexpected march to Plevna — the scene of his early victories, and his heroic defense. By the Berlin treaty of July 13, 1878, it now belongs to the principality of Bulgaria. Pop. about 15,000.

**Wide Awakes,** the name adopted by political clubs of Republican affinities, organized for the purpose of aiding in the election of Abraham Lincoln, during the presidential campaign of 1860. The first club was organized in Hartford, Conn. They were so popular at home, and their torchlight processions aroused so much enthusiasm that the organization grew rapidly and was imitated in many other places. It is stated that in New York city there were on one occasion 20,000 of them marching in procession.

**Widener, Peter A. Brown,** an American capitalist; born in Philadelphia, Pa., Nov. 13, 1834; was early engaged in the meat business, in which he acquired a large fortune. Turning his attention to politics he was appointed to fill out the unexpired term of Joseph F. Mercer as city treasurer of Philadelphia in 1873, and in 1874 was elected for a full term. He became president of the West Philadelphia Passenger Railway Company, vice-president of the Union Passenger and the Philadelphia Traction Companies; a director of the Continental and Empire Passenger Companies; and in 1902 was head of a syndicate organized to acquire large street railroad interests in New York city. In 1897, he gave his city residence in Philadelphia, valued at $600,-

000, for a branch of the Free Lending Library; in 1898 presented a collection of 500 rare books valued at $28,000 to the library; and in 1899 undertook the erection and endowment of a combined home, hospital and industrial school, in Philadelphia, at a cost of $2,000,000.

**Widow Duck,** the *Dendrocygna viduata,* ranging from South America to Africa; length about 18 inches; face and throat white; back of head, nape, and sides of neck bright reddish-brown; sides of breast and back reddish-olive, darkly spotted and marked; lower back, center of tail, and under side below the breast black; sides grayish-white, striped with dark-brown; upper wing coverts reddish-brown, secondary quills olive-brown with green edges; quills and tail feathers greenish-black. According to Schomburgk the natives of British Guiana call this bird *vis-sis-si,* from its cry.

**Widow Monkey,** the *Callithrix lugens,* from South America. It has been compared to a diminutive black dog with a white face; the neck and fore limbs are also white, and this disposition of color has given rise to the popular name bestowed on the animal by the Creoles, who see in the whiteness of the face, neck, and arms, some resemblance to the veil, handkerchief, and gloves worn by widows of their own race.

**Widow Sacrifice,** a form of funeral sacrifice in which the widow was slain or induced to commit suicide so that she might be buried with her husband and accompany him to the world of spirits. This practice is mentioned as existing among the Greeks by Euripides and Pausanias, and from Cæsar it may be inferred that it existed also in Gaul. Widow sacrifice is still the custom in many African tribes; traces of it may be found in China; it lingered till late in the first half of the 19th century in Fiji, and though abolished by law in British India in 1829, is not yet abandoned.

**Wied, Prince Alexander Philipp Maximilian von,** a German naturalist; born in Neuwied, Sept. 23, 1782. He became Major-General in the Prussian army, but left it for scientific pursuits. He traveled in Brazil in 1815–1817, and in 1833 went on a tour through the United States. As a result of these trips he wrote: "Travels in Brazil" (1820); "Descriptions of the Natural History of Brazil" (1824–1833); and "A Journey through North America" (1833–1843). He died Feb. 3, 1867.

**Wieland, Christoph Martin,** a German poet; born in Oberholzheim, Germany, Sept. 5, 1733; was educated at the University of Tübingen; appointed Professor of Philosophy in 1769 at Erfurt; and three years afterward went to Weimar as teacher to the sons of Duchess Anna Amalie. Here, or in the immediate neighborhood, he resided till his death, being a member of the circle to which Goethe, Schiller, and Herder belonged. The early period of his literary life was devoted to pietistic or at least serious poetry such as "The Nature of Things" (1752); "Twelve Moral Letters in Verse Anti-Ovid" (1752);" The Trial of Abraham's Faith" (1753); in the second period he produced the romances "Agathon" (1766); and "Don Sylvio de Rosalva" (1764); the poem "Musarion" (1768); and a prose translation of Shakespeare (8 vols. 1762–1766); while in the third and ripest period were written the romantic epic of "Oberon" (1781); "History of the Abderites" (1781); "The Republic of Fools" (1861); "The Secret History of Peregrinus Proteus" (1791); etc. He also published translations of Horace, Lucian, and the "Letters of Cicero." He died in Weimar, Germany, Jan. 20, 1813.

**Wieliczka,** a town in Galicia, Austria; 9 miles S. E. of Cracow; famous for its wonderful salt mines, which have been continuously worked since 1250. They consist of seven different levels, or stories, one above the other, connected by intricate passages and flights of steps, and in some places by lofty bridges, measure from E. to W. 12,468 feet, from N. to S. 3,117 feet, and reach their greatest depth at 918 feet. The annual production of salt up to 1872 was 37,000 tons, but since that date it has gone down to 30,000 tons. Several of the disused galleries have been adorned with statues hewn in the rock salt, and two chapels have been excavated, in the larger of which the Mass is celebrated annually on July 3. The chapels were injured by the inundation of 1868. Pop. 6,820.

**Wier, Johann,** a German physician, one of the first opponents of the witchcraft superstition; born in Grave, North Brabant, in 1516; studied medicine in Paris and Orleans; and settled about 1545 as a physician at Arnheim, whence he was called to Düsseldorf to be physician to Wilhelm IV., Duke of Jülich Cleves, and Berg. To him he dedicated a plea addressed to the duke and all princes against the folly and cruelty of the witchcraft trials. The book pleased Duke Wilhelm, but roused the fury of the clergy. It still stands in the "Index," but it has given its author a name to be remembered among the benefactors of humanity. Wier was a Protestant, and had been a pupil of Cornelius Agrippa, and so his respect for authority was naturally weakened; but it cannot be said that his skepticism is audacious. The duke protected him till his death on a journey in Secklenburg, Feb. 24, 1588.

**Wiertz, Anton Joseph,** a Belgian painter; born in Dinant, Belgium, Feb. 22, 1806;

studied at Antwerp and Rome. In 1836 he settled in Liége, and in 1848 at Brussels. His original artistic ideal was to combine the excellences of Michael Angelo and Rubens; and his efforts in this direction are visible in his pictures of "The Fight of Greeks and Trojans round the Dead Body of Patroclus," "The Disobedient Angels," "The Death of St. Denis," "Eve and Satan," "The Flight into Egypt," and "The Triumph of Christ" — some of them very large canvases. As he could not persuade himself to sell such pictures, he maintained himself now and later by painting portraits. About 1848–1850 he developed a new technical method which he called "Peinture Mate"; and now he began to paint totally different subjects — speculative and mystical pieces, dreams and visions, and the horrible outcome of a morbid imagination — premature burial, suicide, madness, execution, sensations after death. There were genre pictures also which were only eccentric — "Quasimodo," "The Young Witch;" and even pleasing and kindly pictures — "The Maid at her Toilet," "The Confession"; and he also left some sculptures. In 1850 the state had built for him a large studio in Brussels, and at his death this became, by an arrangement between the state and his heirs, the Musée Wiertz, one of the sights of the city. He died in Brussels, June 18, 1865.

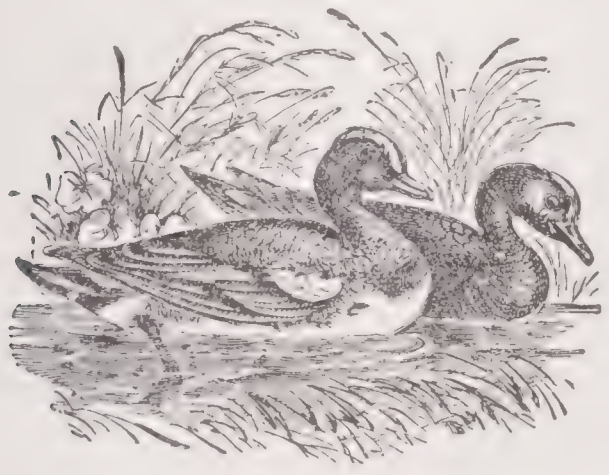
**Wiesbaden,** a town of Prussia, province of Hessen-Nassau; until 1866 capital of the independent duchy of Nassau; on the S. W. spurs of the Taunus Mountains, 377 feet above the sea; 6 miles W. of Mainz. It is well built, and contains a large number of splendid hotels. The chief buildings are the Gothic Protestant church (1853–1862), a noble edifice with five lofty towers, containing colossal marble statues of Christ and the four Evangelists; the Roman Catholic church (1844–1849), in the Romanesque style; the English church (1863–1865); the new synagogue, in the Oriental style; the Schloss (1837–1840); the museum, with a picture gallery, a collection of antiquities, a natural history collection, and a library of 70,000 volumes; the Pauline palace (1842), in Moorish style; the government buildings (1842), in the Florentine palatial style; the Greek chapel, erected by the Duke of Nassau as a mausoleum for his first wife, Elizabeth Michailowna; and the Kursaal, the principal resort of visitors, the largest hall of which is 132 feet long, 60 feet wide, and 48 feet high. Connected with the Kursaal by a long iron Trinkhalle is the Kochbrunnen, the principal of the 22 medicinal springs of Wiesbaden. Its waters have a temperature of 156° F. The second spring is that in the garden of the Adler Hotel, 147° F. Wiesbaden is one of the most frequented spas in Europe. The springs of Weisbaden are spoken of by Pliny as the "Fontes Mattiaci," and on the Heidenberg, N. of the town, traces of a Roman fortress were discovered in 1838, which seems to have been connected with the town by a wall, the Heidenmauer ("heathens' wall"), in the ruins of which votive tablets and inscriptions have been discovered. Pop. (1905) 100,953.

**Wig,** a covering for the head, not merely to conceal baldness, but, like elaborate coiffures of the natural hair, to add to the dignity or formidableness of the wearer. Wigs are found on Egyptian mummies, and are indicated in Assyrian sculptures, and passed from Persians, Medes, Lydians, and Carians to Greeks and Romans. But the wigmaking and wigwearing as known to moderns originated in France, and the palmy days of wigs were in the 17th and early 18th centuries. Originally more or less an attempt to reproduce an exceptionally fine head of hair, wigs became in the *allongé perruque* huge masses of hair that, falling down on the shoulders, were parted into two groups or bunches of ringlets, one on each breast. Louis XIV. wore a wig till then of unparalleled size. The English full dress wig of Queen Anne's time was similar; and this cumbrous type survives in the full-dress flat-bottomed wig of English judges, which has flaps of 20 or more rows of stiff and formal curls hanging down in front. The smaller and more ordinary tie wig (in which the lower part of the wig was tied) is fairly represented by the judge's undress wig and the barrister's or advocate's frizzed wig. Another form was the bag wig — the lower part of the wig being tucked into a silken bag on the shoulders. The sergeant's coif is extinct. When the wearing of wigs was fully established small boys of the well-to-do classes went to school in wigs and cocked hats. In the early part of George III.'s reign it became more and more usual for private persons to do without wigs, wearing their own hair powdered and tied or looped up like a wig; professional men, especially doctors, stuck longer to them. Just before the French Revolution, which dealt the final death-blow to wig-wearing, a gentleman's wig would cost from $150 to $200. It should be noted that in France the Catholic Church had resolutely but in vain opposed itself to the introduction of the custom. Bishop Blomfield was the first bishop who set the example of wearing his own hair; Archbishop Sumner still wore a wig at the wedding of the Princess Royal of England in 1858. Professional wigs are now only worn by the Speaker of the House of Commons (a full-bottomed one), judges, and barristers. Such wigs are made of white horse-hair, laboriously cleaned, curled, and woven on silk threads, and fitted. Wigs to supply natural

deficiency of hair are of course made of human hair. Stage wigs are often made of jute.

**Wigan,** a municipal and parliamentary borough, Lancashire, England, on the Douglas, 21 miles N. E. of Liverpool. Wigan stands in the center of an extensive coal field, and its manufactures, which are important, consist chiefly of calicoes, fustians, and other cotton goods, linens, checks, cotton twist, etc., besides iron foundries, iron forges, railway car works, iron rolling mills, large breweries, chemical works, and corn and paper mills. Pop. (1901) 60,770.

**Wigeon,** in ornithology, any species or individual of the genus *Mareca*, specifically, the *M. penelope*. Length about 18 inches;



MALE AND FEMALE WIGEONS.

the male has the forehead and top of head white, cheeks and hind part of the neck reddish-chestnut, upper parts grayish white, irregularly zigzagged with black, wing coverts white tipped with black, primaries dark brown, speculum green, edged with black; throat rufous, breast and belly white; the female has sober plumage of various shades of brown. The wigeon is one of the commonest ducks of the extreme N. of Europe, frequenting grassy swamps, lakes, and rivers, and feeding in the daytime, chiefly on aquatic vegetation. The American wigeon (*Mareca americana*) is larger than the European or common wigeon, and has the upper parts finely waved transversely with black and reddish-brown, top of head and under parts white. It breeds chiefly in the N. parts of America and is common in winter on the coasts of the United States and in the rice fields. The flesh of both species is esteemed for the table.

**Wiggin, Kate Douglas,** an American author; born (Smith) in Philadelphia, Pa., Sept. 28, 1857. Her youth was spent in Hollis, Me., and she attended Abbott Academy in Andover, Mass. She went to California in 1876, where she studied the kindergarten system in Los Angeles; later, she taught a year in Santa Barbara College; then went to San Francisco, where she organized the first free kindergarten in the West. In 1880 she organized the California Kindergarten Training School, with her sister Nora A. Smith, and Mrs. S. B. Cooper. In 1880 she married S. B. Wiggin, a lawyer, and they moved to New York, where Mr. Wiggin died in 1889. In 1895 Mrs. Wiggin married George C. Riggs. She has written many stories and books on and for the kindergarten, among them being "The Story of Patsy," "The Birds' Christmas Carol," "Polly Oliver's Problem," "The Story Hour," and "Kindergarten Principles and Practice."

**Wigglesworth, Michael,** an American clergyman; born in Yorkshire, England, Oct. 18, 1631. His best-known work, "The Day of Doom" (1662), was a popular poem in New England for a long period. He published: "God's Controversy with New England" and "Meat out of the Eater," in verse; and also "A Discourse on Eternity." He died in Malden, Mass., June 10, 1705.

**Wight, Orlando Williams,** an American editor; born in Centerville, N. Y., Feb. 19, 1824. A Universalist minister originally, he practised medicine in Wisconsin, where he was appointed State geologist and surgeon-general in 1874; health commissioner of Milwaukee, 1878–1880; later he was health officer of Detroit. He wrote: "Lives and Letters of Abélard and Héloïse" (new ed. 1861); "Maxims of Public Health" (1884); "People and Countries Visited" (1888), travels; edited "Philosophy of Sir William Hamilton" (1853); "Standard French Classics" (12 vols. 1859); "The Household Library" (18 vols. 1859); and translated Cousin's "History of Modern Philosophy" (1852, with F. W. Ricord); "Lectures on the True, the Beautiful, and the Good" (1854); Martin's "History of France" (1863, with Mary L. Booth). He died in Detroit, Mich., Oct. 19, 1888.

**Wight, Isle of,** an island off the S. coast of England; in the county of Hants; separated from the mainland by Spithead and the Solent; 23 miles in length, 13 miles broad; area, 93,341 acres. The main slope of the island is to the N., as is shown by the course of its chief streams, the Medina, Yar, and Eastern Yar. A range of chalk downs, which cross the island from E. to W. and form excellent sheep walks, separate it into two districts somewhat different in character. The general appearance is picturesque, and the geology of the island is interesting. The air is remarkably mild, and the district known as the Undercliff, lying along the S. coast, and completely sheltered from the N. has long been a resort for invalids. The Isle of Wight is represented in parliament by one member. The chief towns are Newport (the capital), Ryde,

Cowes, Ventnor, Bembridge, Freshwater, Yarmouth, and the fashionable health resorts of Sandown and Shanklin. Near Cowes is Osborne House, which was a favorite residence of Queen Victoria. Carisbrooke Castle is an interesting ruin. Pop. (1901) 82,418.

**Wightia** (named after Dr. Wight, the Indian botanist), a genus of *Chelonœæ*. Only known species, *W. tomentosa*, an immense tree, clinging by means of aërial roots to the stems on which it is a parasite, and rising into the air with masses of pink flowers. It is found in the forests of Sikkim and Bhutan, in the zone from 3,000 to 7,000 feet in elevation, and is used for making Buddhist idols.

**Wigwam,** an Indian hut or cabin. They are generally of a conical shape, formed of bark or mats laid over stakes planted in the ground, and converging toward the top, where there is an opening for the escape of the smoke. The word has also been applied to a large temporary structure for public gatherings; as, the wigwam in which the Democratic National Convention was held in Chicago, in the year 1892.

INDIAN WIGWAMS.

**Wilberforce, Samuel,** an English clergyman; son of William Wilberforce, the philanthropist; born in Clapham, England, Sept. 7, 1805; was graduated at Oriel College, Oxford; appointed curate of Checkendon (1828), rector of Brightstone in the Isle of Wight (1830); became a rural dean (1836), canon of Winchester (1840), Bampton lecturer (1841), dean of Westminster (1845), and in the same year Bishop of Oxford. He was the leader of the High Church party, and the author of "Notebook of a Country Clergyman" (1833); "Eucharistica" (1839); "A History of the Protestant Episcopal Church in America" (1844), a volume of "University Sermons"; and numerous other works. He died near Dorking, July 19, 1873.

**Wilberforce, William,** an English philanthropist; born in Hull, England, Aug. 24, 1759. After completing his education at St. John's College, Cambridge, he was, in 1780, elected to Parliament for his native town; and in 1784 he was returned by the county of York. In 1786 he made the acquaintance of Clarkson, who gained his sympathies on behalf of the agitation against the slave trade. In 1791 he moved for leave to bring in a bill to prevent further importation of African negroes into the British colonies. Year after year he pressed this measure, but was always defeated till 1807, when it was passed during the short administration of Fox. He then devoted his energies to bring about the total abolition of slavery, and three days before his death he was informed that the House of Commons had passed a bill which extinguished slavery in the British colonies. He died in Cadogan Place, London, July 29, 1833.

**Wilberforce University,** a coeducational institution in Wilberforce, O.; for colored students; founded in 1856 under the auspices of the Methodist Episcopal and African Methodist Episcopal Conferences of Ohio; closed at outbreak of the Civil War; reopened in 1863 by the African Methodist Episcopal Church alone; has property valued at over $370,000; average number of faculty, 30; average students, 400.

**Wilbrod, or Willibrod, St.,** born in the Saxon kingdom of Northumbria, about 657; generally called "The Apostle of the Friesians." He was a monk of Wilfred's monastery, at Ripon, and about 677 went to Ireland to preach Christianity. In 690 he went to Utrecht, and having, after great exertions, converted large numbers of the Friesians to Christianity, he was rewarded with the bishropric of Utrecht by Pope Sergius I. He also preached to the Danes, and established the monastery of Epternach, near Treves. He died in 738. He is commemorated in the Roman Catholic Church on Nov. 7.

**Wilbour, Charles Edwin,** an American Egyptologist; born in Little Compton, R. I., March 17, 1833. He was associated with the New York journals up to 1872, when he began the study of Egyptian antiquities; and was afterward the companion of Brugsch Bey and Maspero in many exploring expeditions in Upper Egypt. He has published translations from the French: "Rachel in the New World," from Léon Beauvallet (1856); Victor Hugo's "Les Misérables" (1862–1863); and Renan's "Life of Jesus" (1863). He died in Paris, France, Dec. 17, 1896.

**Wilbrandt, Adolf,** a German dramatist; born in Rostock, Germany, Aug. 24, 1837. Among his dramas, which have been successfully presented in all the principal theaters of Germany, are: "Graf Hammerstein" (1870), "Gracchus" (1872), "Arria and Messalina" (1874), "Giordano Bruno" (1874), "Nero" (1876), "Kriemhild" (1877), tragedies; "Youthful Love" (1872), and "Natalie" (1878), comedies. He has treat-

ed the great social and literary questions of his day in the three novels "Adam's Sons" (1890), "Hermann Ifinger" (1892), and "The Thorny Path" (1894).

**Wilburites,** a section of American Quakers, named from their leader, John Wilbur, who separated from the main body in the first half of the 19th century on the ground that the Quakers were abandoning their original principles.

**Wilcox, Ella Wheeler,** an American poet; born in Johnstown Center, Wis., about 1855. She contributed much to current periodicals, and her poems were widely copied. Some of her volumes are: "Maurine" (1882); "Poems of Passion" (1883); and "Poems of Pleasure" (1888); "Drops of Water"; "Sweet Danger"; etc. She also published a novel, "Mal Moulée" (1885).

**Wilcox, Robert William,** an American statesman; born in Kuhulu, Honolulu, Hawaii, Feb. 15, 1855; was graduated at the Royal Military Academy, Turin, Italy, in 1885; returned to Hawaii and in 1889 headed the revolution in Honolulu to restore the old constitution. In 1895 he commanded the revolutionists in an effort to restore Queen Liliuokalani, in their struggle with the Dole government; was captured and sentenced to death; but at the request of the United States government, President Dole commuted the sentence to imprisonment for 35 years, with $10,000 fine. In 1896 he was pardoned, and in 1901 was elected delegate in Congress for Hawaii. Died in 1903.

**Wild Animals in Winter.** The devices of animal life to bridge over the winter season, and their ways and habits during this time, present an interesting, indeed fascinating, page of nature. Why certain forms should defy the elements and roam abroad, seeking a precarious livelihood, while others, much stronger and apparently better equipped by Nature to survive the struggle, enter the strange and remarkable winter sleep with all their functions in abeyance, and sleep away the winter, is one of the problems that is of more or less interest. The fox well illustrates the former with its winter habit of prowling over the snow.

At the approach of winter, animals are affected in various ways. In the North all the reptiles — snakes, lizards, frogs and toads, a vast concourse — disappear in a most miraculous manner. The snakes enter holes and crevices, projecting themselves as far into the earth as possible, and, coiled tightly, assume a condition resembling a state of coma, in which they remain till the heat of the sun comes to waken them the following spring, when they appear voracious, and eager for prey to rehabilitate them physically after months of fasting. The frogs plunge down into the mud of the ponds where they have made music during the long summer; and the same is true of turtles. Lizards affect the same places as snakes, and when taken out during the winter are apparently lifeless. In some marvelous manner the functions of life are arrested. There appears to be a minimum consumption of tissue; Nature apparently making an exact calculation, the functions of life being so almost completely arrested that they are enabled to lie in this quiescent state without food or water, or till the food supply comes again and the conditions are favorable to outdoor life.

This is the case with the reptiles of the Eastern and Middle States, or wherever there is a cold winter, ice and snow; but on the Pacific slope, in Southern California, in the same latitude as the above, a different condition holds. Here — and the San Gabriel valley may be taken as an example — the lizards are subjected to a winter and summer every 24 hours. There is no snow, the days are bright and beautiful, resembling a cool Eastern summer, and insect life does not disappear. All winter I have found lizards basking in the sun on these bright days, but as the winter day wears on and four o'clock approaches, there is a very material change — a strange chill that affects reptilian life at once. It is their winter, and just as the Eastern lizard creeps down into the earth for shelter and enters its winter sleep, so this California lizard crawls out of sight beneath rocks, into crevices or under the bark of trees, and enters what is the equivalent of a state of coma. It seems to shrivel, becomes seemingly intensely cold, often stretches out its entire length and lies to all intents and purposes dead and lifeless, in this way passing the night till nine or ten o'clock in the morning when the rays of the sun slowly bring it back to life.

This curious night coma is, so far as appearances go, identical with the winter sleep of Eastern lizards. The functions are in abeyance for the time and life is at its lowest ebb. In observing these sleepers I have found them by turning over the piles of stones early in the morning, and have often found a row of them, limp, cold and apparently dead, lying in the sun, and have watched the gradual return to life. It came very slowly; those lizards placed on their backs first showing signs of life by a quivering of the limbs which were then drawn up; then the long tail would move, and finally the little sleeper would clumsily roll over into an upright position; and as the direct rays of the sun struck and warmed it into life its eyes would grow brighter, and suddenly, as though touched by some magic wand, its head would be lifted high, the blue breastplate gleamed in the light, and with an air of astonishment and alarm this sleeper awakened would dash over the

ground and escape, once more a living creature, a type of activity, a menace to insect life. Every night in the Californian winter this occurs, and the condition can easily be superinduced by subjecting the animals to artificial cold. The bears in Southern California are found abroad at all times, while in the N part of the State and in the East they enter into a complete state of hibernation, going into their winter sleep well conditioned and fat, evidently living on the latter till spring, when they emerge lean and ugly.

The change in color of animals at the approach of the winter season is one of the remarkable features of life. The ermine as an example and several others assume a white coat, the change being a protective feature. The ptarmigan has a similar habit, a change which renders it inconspicuous to its various enemies.

At the approach of winter the birds perhaps present the most remarkable spectacle. With some few exceptions they move away from the conditions which threaten them; and in what is popularly called the departure and return of the birds we contemplate a wonderful migration, in which the highest instinct of self-preservation appears to have been developed. The birds of the coast have a definite line of migration; the shore line constitutes a bird highway, over which tens of thousands are passing — in the autumn to the South, where there is a food supply; in the spring to the North, to the fields they know so well, and the nesting places where the young are to be raised. Much of this migration is carried on at night high in air, and during storms myriads of birds are often confused and killed by dashing blindly into the lighthouses marking the highway.

On the Pacific coast the Coast Range and Sierra Nevada mountains constitute a well-defined line of travel. In Southern California the flight of cranes and geese along this pathway is a remarkable sight. The birds, especially the cranes, cover long distances by soaring, gradually reaching a height within rifle shot from the ground; then they stop and begin a spiral movement, turning in graceful curves, flashing in the sunlight as they turn and disappear, rising ever higher till they are a mile or more above the valley, or above the summit of the Sierra Madre; then, as though at the command of the leader, they turn, and in long lines soar away with remarkable velocity, literally sliding down hill, covering 6 or 7 miles or more before the maneuver is repeated.

The winter finds the trees, groves and gardens deserted except by the few forms which defy the cold. The birds are in the South — Florida, Cuba and even South America; the reptiles are housed underground; insect life has been destroyed or is hibernating, and will spring into life in the spring. The only animals abroad are the mammals; the deer, elk, caribou, fox, cougar, wild rat, lynx and other forms, which wander over the barren wastes and in the deep snows of the woodlands, finding a precarious living till the spring comes; when the wanderers return and all life takes on a new meaning.

**Wilde, George Francis Faxon,** an American naval officer; born in Braintree, Mass., Feb. 23, 1845; was graduated at the United States Naval Academy in 1864; attached to the steam sloop "Susquehanna" of the Brazil squadron in 1865–1866; promoted master in 1866; lieutenant and lieutenant-commander in 1868; commander in 1885; and captain in 1898. He was given charge of the dispatch boat "Dolphin," in which he made a trip around the world. In 1889 he was made lighthouse inspector. During the American-Spanish War in 1898 he was in command of the ram "Katahdin." In command of the "Boston" he landed the first marines ever landed in China, and sent them to Peking, where they guarded the legation, November, 1898–April, 1899; captured the city of Iloilo, Philippine Islands, Feb. 11, 1899, for which he received the thanks of the Secretary of the Navy; captured Vigan, Feb. 18, 1900; and was in command of the "Oregon" when she grounded at an uncharted ledge in Pichili Gulf. The "Oregon" was badly damaged, but steamed 765 miles to the Japanese dock yards. Rear-Admiral, 1904; retired, 1905.

**Wilde, Jane Francesca Elgee, Lady** ("Speranza"), an Irish poet, mother of Oscar; born in Wexford, in 1826. She wrote: "Ugo Bassi" (1857); "Poems" (1864); "Driftwood from Scandinavia" (1884); "Ancient Legends, etc., of Ireland" (1886); "The Glacier Land." She died in Chelsea, England, Feb. 3, 1896.

**Wilde, Oscar Fingal O'Flahertie Wills,** an Irish poet; born in Dublin, Ireland, in 1856. Some of his works are: "Poems" (1880); "The Picture of Dorian Gray," a novel; "The Happy Prince, and Other Tales" (1888); "Guido Ferranti" (1890), and "The Duchess of Padua," tragedies; "Intentions," essays (1891); "Lord Arthur Savile's Crimes, and Other Stories" (1891); "Lady Windermere's Fan," "A Woman of No Importance," and "The Importance of Being Earnest," and other comedies. He died in Paris, Nov. 30, 1900.

**Wildenbruch, Ernst von,** a German dramatist; born in Beyrût, Syria, Feb. 3, 1845. His dramas have been played with great success in most German cities. Some of them are: "Fathers and Sons" (1882); "Harold" (4th ed. 1884; English translation 1891); "Christopher Marlowe" (1884); "The Mennonite" (3d ed.

1886); "The Carlovingians" (4th ed. 1887); "The Quitzows" (1888); "The New Master" (1891). He also published a number of short stories and novels, the best of which is "The Master of Tanagra" (1880). In his "Lays and Songs" (1877) and "Poems and Ballads" (1884), are some great ballads and hymns, including "The Witches' Song." He died Jan. 15, 1909.

**Wilder, Alexander,** an American physician; born in Verona, N. Y., May 13, 1823; was graduated at Syracuse Medical College in 1850. He was president of the Eclectic Medical College, New York (1867); lecturer on physiology and physiological medicine (1873–1877); Professor of Physiology and of Psychological Science in the United States Medical College. Besides technical works, he wrote "The Worship of the Serpent" (1877); "The Soul" "Life Eternal" "Paul and Pluto"; etc.; and edited works on archæology. He died Sept. 19, 1908.

**Wilder, Burt Green,** an American educator; born in Boston, Mass., Aug. 11, 1841; was graduated at the Lawrence Scientific School; and served in the Union army as medical cadet, assistant surgeon, and surgeon of the 55th Massachusetts Infantry in 1862–1865. In 1863 he discovered a large spider (since named *Nephila wilderi*), from which he reeled 150 yards of yellow silk. He became Professor of Neurology, Vertebrate Zoölogy, and Physiology at Cornell University in 1867. His publications include "What Young People Should Know" (1874); "Anatomical Technology"; Physiology" (1882); "Health Notes for Students"; etc.

**Wilder, Marshall Pinckney,** an American humorist; born in Geneva, N. Y., Sept. 19, 1859; received a fair education, and became a stenographer. He soon, however, developed a remarkable ability as a humorist, which was rendered all the more attractive by his diminutive stature; and for several years he was a popular entertainer, especially in private drawing-room gatherings both in the United States and England. He is the author of "People I've Smiled With."

**Wilderness,** a location in Spottsylvania co., Va.; 16 miles W. of Fredericksburg. During the Civil War a sanguinary battle was fought here, May 5 and 6, 1864, between the Nationals under General Grant, and the Confederates, commanded by General Lee, which, after a terrific struggle, and unprecedented slaughter, particularly on the side of the Nationals, resulted in both sides claiming the victory, General Lee, nevertheless, gradually retiring on Spottsylvania. The National loss amounted to 18,000 men; that of the Confederates to about 11,000.

**Wildes, Frank,** an American naval officer; born in Boston, Mass., June 17, 1843; was graduated at the United States Naval Academy in 1863; served on the steam sloop "Lackawanna" in the West Gulf squadron till the surrender of Fort Morgan; and was then detailed to the monitor "Chickasaw," on which he served till the occupation of the city of Mobile in 1865. After the war he served on various stations; was commander of the cruiser "Boston" in the Asiatic station in 1895–1898; and was engaged in the battle of Manila Bay on May 1 of the latter year. He was appointed captain of the New York navy yard in 1899, and was promoted rear-admiral, Oct. 14, 1901. He died Feb. 6, 1903.

**Wild Fowl,** the name applied to birds of various species, which are pursued as game, but restricted by some authorities to birds belonging to the grallatorial and natatorial orders — in other words, to the waders and swimmers. Wild-fowling is a favorite British sport, involving in its exercise care, ingenuity, cunning, and even danger. Wild fowl may be approached with a view to their capture or destruction in various ways. In "fowling" proper, the decoy pond is perhaps the best known means for the capture of wild fowl in a living state. The pond is constructed in a secluded place, well sheltered by trees, and with a plentiful supply of reeds and sedges. From this pond pipes or narrow passages are led, these passages attaining each a length of from 60 to 80 yards, and gradually narrowing toward its termination. Above, the pipe is bridged and covered by a light network, and at its termination it ends in a tunnel net, which is, as a rule, carried out on to the land. Decoy ducks, which come to be fed at the call of the attendants, are used to entice their wild neighbors into the pipe; but the decoy dog is perhaps a more valuable ally of the fowler. This dog is named a "piper." It is of a small breed, and indulges in playful gambols by the side of the pipe, appearing now and then in advance of the fowl, which, led by curiosity, swims onward toward the dog, and is thus drawn toward the terminal net. The dog preserves a perfect silence during its maneuvers. The basins named flight ponds consist of sheets of water of limited extent, guarded by nets so placed as to entrap such birds as the pochard as they rise from the water. Wild fowl are also captured by shooting from punts and shooting boats, great care being necessary in approaching the haunts of the birds; and the stalking horse, still used in some parts of England, is also employed; the body of the horse — which requires special training for its work — being used to conceal the sportsman from the game.

**Wild Goat,** a popular name for any undomesticated species of the genus *Capra*, many of which have been erected into sepa-

rate genera by some authorities. They are: *Capra pyrenaica* (Spanish ibex), *C. ibex* (the ibex), *C. ægagrus, C. caucasica, C. sinaitica* (the Sinaitic ibex), *C. walie, C. sibirica, C. falconeri* (the markhoor), *C. jemlanica* (the tahr), and *C. hylocrius* (the Neilgherry ibex).

**Wild Goose,** any species of undomesticated goose — especially the Canadian goose, *Branta canadensis;* the European bean goose and the graylag. Figuratively (plural), a term applied to the recruits for the Irish Brigade in the service of France in the 17th and 18th centuries. A "wild-goose chase" means the pursuit of anything in ignorance of the course it will take; hence, a foolish pursuit or enterprise. According to Dyce, a wild-goose chase was a kind of horse race, in which two horses were started together, and whichever rider could get the lead, the other was obliged to follow him over whatever ground he chose to go.

**Wild Horse,** any undomesticated individual of the species *Equus caballus.* According to Darwin, no aboriginal or truly wild horse is known, and the herds of so-called wild horses in Asia are probably, as those in America and Australia are certainly, descended from ancestors which escaped from the control of man.

**Wild Hunt,** the name given by the German people to a fancied noise sometimes heard in the air at night, mostly between Christmas and Epiphany, as of a host of spirits rushing along, accompanied by the shouting of huntsmen and the baying of dogs. The root of the notion is doubtless to be found in the Christian degradation of the old heathen gods. Like Woden, the lord of all atmospheric and weather phenomena, and consequently of storms, the wild huntsman also appears on horseback, in hat and cloak, accompanied by a train of spirits — by the ghosts of drunkards, suicides, and other malefactors, often without heads, or otherwise mutilated. When he comes to a crossroad, he falls, and gets up on the other side. Generally he brings hurt or destruction, especially to any one rash enough to address him or join in the hunting cry, as many persons valiant in their drink have done. Whoever remains standing in the middle of the highway, or steps aside into a tilled field, or throws himself in silence on the earth, escapes the danger. In many districts heroes of the older or of the more modern legends take the place of Odin; thus, in Lusatia, Dietrich of Bern; in Swabia, Berchtold; in Sleswick, King Abel; in Lower Hesse, Charles the Great; in England, King Arthur; in Denmark, King Waldemar. The legend has also in recent times attached itself to individual sportsmen, who, as a punishment for their immoderateness or cruelty in sport, or for hunting on Sunday, were condemned henceforth to follow the chase by night. In Lower Germany there are many such stories current of one Hakkelberend, whose tomb even is shown in several places.

Another version of the wild hunt is to be found in the legend prevalent in Thuringia. There the procession, formed partly of children who had died unbaptized, and headed by Frau Holle or Holda, passed yearly through the country on Holy Thursday, and the assembled people waited its arrival, as if a mighty king were approaching. An old man with white hair, the faithful Eckhart, preceded the spirit host to warn the people out of the way. In one form or other the legend of the wild hunt is spread over all German countries, and is found also in France, and even in Spain. In England we meet substantially the same notion in folk-lore — phantom dogs, like the black Shuck-dog of Norfolk and the Mauthe hound of Peel in Man, the "Wisht Hounds" of Dartmoor, headless horses, a ghostly coach and horses swept along in a storm of wind.

**Wild Indigo,** the *Baptisia tinctoria,* a papilionaceous plant with yellow flowers, growing in North America. It yields an inferior kind of indigo. The root and leaves are considered to be astringent and antiseptic.

**Wild Lichen,** in pathology, the *Lichen agrius,* the most severe form of lichen. It commences with fever, then inflamed papulæ follow, which go on to furfuraceous desquamation or fissures in the skin, sending forth a sero-purulent fluid. Mild cases last a fortnight, more severe ones several months.

**Wild Lime,** the *Atalantia monophylla,* a shrub with white flowers, belonging to the *Aurantiaceæ.* Its wood, which is heavy, closely grained, and yellow, is used on the Coromandel coast for cabinet purposes.

**Wild Sheep,** any undomesticated species of the genus *Ovis.* They are distinguished by their greater size, massive horns present in both sexes, shorter tail, and in some cases by a beard and mane. The most noteworthy are the wild sheep of the Alpine ranges and plateaux of Central Asia, the wild sheep of Kamtchatka and Northwestern America (*O. nivalis*), the argabi or bighorn (*O. canadensis*), the mouflon of Corsica and Sardinia (*O. musimon*), the burrhel (*O. nahura*), the Barbary sheep (*O. tragelaphus*), and Marco Polo's sheep (*O. poli*), from Central Asia.

**Wild Vine,** the *Vitis labrusca,* a North American vine, with broadly cordate, angularly sub-lobed leaves, tomentose beneath, small racemes of flowers, and large berries, inferior in value to those of the true vine.

**Wiley University,** a coeducational institution for colored students, in Marshal, Tex.; founded in 1873 under the auspices of the Methodist Episcopal Church; reported at the close of 1901: Professors and instructors, 15; students, 439; volumes in the library, 4,200; grounds and buildings valued at $30,000; benefactions, $1,400; income, $11,360; number of graduates, 62; president, Rev. M. W. Dogan, A. M.

**Wilfrid, St.,** Bishop of York; born in Northumbria in 634. He was brought up in the monastery of Lindisfarne, but at 18 visited Rome, returning in 658 a warm partisan of the Roman party in the controversy with the native Church on the shape of the tonsure and the time of keeping Easter. At the synod of Whitby (664) he contended against Bishop Colman, and succeeded in gaining over the king, who, learning it was only St. Peter to whom the keys had been given, thought it most prudent to be on his side lest Peter should pay him out in his need by closing the gate on him. Already he had been given the monastery at Ripon, and now he was chosen Bishop of York, being consecrated at Compiègne. On his return he found that Chad had been elected Bishop of Northumbria; but Archbishop Theodore restored Wilfrid. He improved the minster of York, built a splendid church at Hexham, some of the underground portions of which still remain, and raised a new minster at Ripon, the vault of which, called St. Wilfrid's Needle, still exists. Theodore, without consulting Wilfrid, divided Northumbria into the sees of Lindisfarne, Hexham, and Whitherne, in addition to York, and Wilfrid made his appeal to Rome. On the journey he was driven by a storm to the coast of Friesland, the inhabitants of which were still pagan. Such was the effect of his preaching that thousands were baptized, and that work of conversion begun which was to be completed by Boniface and Willibrod. Pope Agatho decided in his favor, but King Ecgfrid flung him into prison. He escaped to Sussex, was allowed to return by the new King Aldfrid in 686, keeping the sees of York and Ripon. But again he appealed to Rome against the measures of the new primate, Berthwald (704), and was finally, after a council held near Ripon, allowed to keep Ripon and Hexham, but not York. He died in Oundle, in Northamptonshire, in 709, and was buried in Ripon.

**Wilhelm, Karl,** a German musical composer; born in Schnalkald, Prussia, Sept. 5, 1815. He taught music in Coefeld, and was director of the Liedertafel there from 1840 to 1865. His composition of the music of the "Watch on the Rhine" in 1854 made him famous. During the Franco-Prussian War this song became the battle cry of the German army, and in 1871 the composer was given a pension of $750. He died in 1875.

**Wilhelmina I.,** Queen of the Netherlands; born in The Hague, Aug. 31, 1880; was the daughter of King William III., of the Netherlands, by his second wife, the Princess Emma Adelaide Wilhelmina Theresa. Her mother was a sister of the Duchess of Albany, being daughter of Prince George Victor of Waldeck-Pyrmont. Queen Wilhelmina succeeded to the throne on the decease of her father, in November, 1890, but her mother acted as Queen-Regent till the young queen came of age, Aug. 31, 1898, and amid the enthusiasm of her people, was installed as sovereign. On Feb. 7, 1901, she married Duke Henry of Mecklenburg-Schwerin.

**Wilhelmshaven,** the chief naval port of Germany; on the W. side of the entrance of the Bay or Gulf of Jahde; 45 miles N. W. of Bremen. The town, first projected in 1856, has been regularly laid out on a strip of ground bought by Prussia from Oldenburg in 1864, and was inaugurated by King William in June, 1869. It is now a fortress of the first rank, defended by outlying forts and an elaborate system of torpedoes, and, with its moles, extensive basins, dry docks, vast stores for the navy, and workshops for all the requirements of a fleet, has been a very costly creation — the massive buildings being erected on soft and swampy ground, without any natural advantage save its situation. Water has been obtained by means of artesian wells. A harbor for commercial purposes has been made to the S. of and connected with the naval one.

**Willbald, Alexis.** See HARING, GEORG W. H.

**Wilken, George Alexander,** a Dutch ethnographer; born in Pomohen, Java, March 13, 1847. After his education at Rotterdam, he served 11 years in the Dutch Indian Civil Service, returning home on furlough in 1880. The year after he became lecturer in the Leyden Municipal Institute. In 1885 he became Professor of the Geography and Ethnography of the Indian Archipelago in the Leyden University. The essays on Indian ethnology and folklore in the "Proceedings of the Royal Institute" possess a value quite unusual even in such publications. Others treat with unexampled fullness of knowledge and clearness of exposition native Dutch Indian theories of relationship and the laws of marriage and inheritance, marriage and betrothal customs, cretinism, the couvade, circumcision, etc. He died in Leyden, Aug. 28, 1891.

**Wilkes, Charles,** an American naval officer; born in New York city, April 3, 1798; entered the navy in 1816 and became a lieutenant in 1826. In 1838 he commanded an

exploring expedition sent by the United States government to the Antarctic regions. He visited South America, Samoa, the Fiji, Hawaiian, and other islands in the Pacific; and made a voyage around the world, returning in 1842. He became commander in 1843, and captain in 1855. In 1861, while in command of the "San Jacinto," he intercepted the British steamer "Trent" and took as prisoners J. M. Mason and J. Slidell, Confederate commissioners to Europe. For this act he received the thanks of Congress, but it was not approved by the President (see TRENT AFFAIR). In 1862 he was promoted commodore, after which he commanded a squadron in the West Indies. In July, 1866, he was made a rear-admiral. He wrote a "Narrative" of his expedition (6 vols. 1845), "Western America," etc. (1849), "Theory of the Winds" (1846); etc. He died in Washington, D. C., Feb. 8, 1877.

**Wilkes, George,** an American journalist; born in New York city, in 1820; was editor of the "Spirit of the Times" from 1850, and well known as a politician and a traveler. He wrote a "History of California" (1845); and a book of travel, "Europe in a Hurry" (1852). He died in New York city, Sept. 23, 1885.

**Wilkes, John,** an English political agitator; born in London, England, Oct. 17, 1727; was educated for some time at Leyden; was elected to Parliament as member for Aylesbury (1757), and attained considerable notoriety by the publication of a paper entitled the "North Briton," in No. 45 of which (1763) he commented severely on the king's speech to Parliament. The home secretary in consequence issued a general warrant, on which Wilkes, with others, was apprehended and committed to the Tower, but released by Chief-Justice Pratt, who declared the prosecution illegal. On the next meeting of Parliament, however, a special law was passed to sanction his prosecution, and in 1764 he was expelled from the House of Commons. As he had by this time withdrawn to France and did not appear to receive sentence, he was outlawed. He returned, however, to England at the election of 1768, and was sent to Parliament as representative of Middlesex, but was expelled from the House and committed to prison. Three times after this he was reëlected within a few months by the same constituency, but the House of Commons persisted in keeping him out, giving rise to a formidable agitation in favor of "Wilkes and liberty." He was released from prison in 1770, having been elected alderman of London, and he was next appointed sheriff of Middlesex, lord-mayor of London, and again (1774) member of Parliament for Middlesex. On this occasion he was allowed to take his seat, and in 1782 the resolutions respecting the disputed Middlesex election were expunged from the journals of the House of Commons. He published many speeches and pamphlets, and two collections of his correspondence were published after his death, in London, Dec, 27, 1797.

**Wilkesbarre,** a city and county-seat of Luzerne co., Pa.; on the Susquehanna river, and on the Lehigh Valley, the Pennsylvania, the New York, Susquehanna, and Western, the Lackawanna, the Delaware and Hudson, and the Central of New Jersey railroads; 18 miles S. W. of Scranton. It is built amid beautiful scenery, near the heart of the celebrated Wyoming valley, and is yearly visited by thousands of tourists. Here are Hillman Academy, high school, Mollinckrodt Convent School, Female Institute, Osterhout Free Library, gas and electric lights, waterworks, electric street railroad system, numerous churches, a public park on the river bank, National and State banks, and many daily, weekly, and monthly periodicals. Wilkesbarre is the center and shipping point of the rich and extensive anthracite coal beds of Wyoming valley. Its annual output of coal is over 12,000,000 tons, the mining of which employs about 36,000 persons. Other industries include lace factories, silk mill, locomotive and engine works, wire rope factory, cutlery works, etc. The city was founded in 1769, incorporated as a town in 1806, and received its city charter in 1871. The great coal vein underlying the city and nearly all of the Wyoming valley has an average thickness of about 56 feet. Coal has been mined here since the Revolutionary period. The assessed property valuations exceed $36,000,000, and the total debt is about $470,000. Pop. (1900) 51,721; (1910) 67,105.

**Wilkie, Sir David,** a Scotch painter; born in Cults, Scotland, Nov. 18, 1785; received his early art training at the Trustees's Academy, Edinburgh; entered the schools of the Royal Academy, London, in 1805; first exhibited there (1806) "The Village Politicians," which at once established his reputation; was elected an associate of the Academy in 1809, and in 1811 became an academician. In 1825, owing to ill health, he made an extended tour through Italy, Germany, and Spain. In the latter country his style as a painter underwent a marked change when he came under the influence of Velasquez and Murillo. Returning after three years to England, he was appointed (1830) painter in ordinary to the king, and was knighted in 1836. His pictures, such as the "Blind Fiddler," "Rent Day," "Cut Finger," "Rabbit on the Wall," "Penny Wedding," "Cottars's Saturday

Night," "Duncan Gray," "Blind Man's Buff," "Chelsea Pensioners Reading the Gazette of Waterloo," "John Knox Preaching Before the Lords of the Congregation," etc., are well known as engravings. These belong for the most part to his early and best period, when his method was characterized by subdued coloring and minute and spirited drawing. His later and less successful style is distinguishable by a breadth of treatment which sometimes shows looseness in drawing, and deals chiefly with historical subjects. It is represented by "The Entrance of George IV. into Holyrood," "The Spanish Council of War," "The Maid of Saragossa," "Napoleon and Pius VII.," and "The Queen's First Council." He died at sea off Gibraltar, June 1, 1841, while returning from a visit to the East.

**Wilkie, John Elbert,** an American Secret Service agent; born in Elgin, Ill., April 27, 1860; began newspaper work on the Chicago "Times" in 1877; was on the Chicago "Tribune" in 1881-1893; engaged in banking and the steamship business in London, England, in 1893-1896; and in the latter year returned to the United States and resumed his work on the Chicago newspapers, making a specialty of criminal investigation. In February, 1898, he was appointed chief of the United States Secret Service, and during the Spanish-American War broke up the Spanish spy system in the United States.

**Wilkins, John,** an English prelate and scientist; born in Northamptonshire, in 1614. He became Bishop of Chester (1668), and one of the founders of the Royal Society (1645). His works were one of the most effective agents in the spread of the Copernican system in England. He wrote: "Discovery of a New World" (1638); "Discourse Concerning a New Planet" (1640); "Mercury; or, The Secret and Swift Messenger, Showing How a Man May Communicate His Thoughts to a Friend at Any Distance" (1641); "Mathematical Magic" (1648); "Essay Toward a Real Character and a Philosophical Language" (1668); "Principles and Duties of Natural Religion" (1675); etc. He died in London, Nov. 19, 1672.

**Wilkins, Mary Eleanor** (Mrs. **Charles M. Freeman**), an American author; born in Randolph, Mass., in 1862. She was educated at Mount Holyoke Seminary, South Hadley, Mass., and in that State and Vermont she lived until her marriage in 1902, when she made her residence in Metuchen, N. J. Her works, which mainly consist of striking stories descriptive of New England life and character, include: "The Adventures of Ann" (1886); "A Humble Romance" (1887); "A New England Nun" (1891); "Young Lucretia" (1892); "Jane Field" (1892); "Giles Corey, Yeoman" (1893), a drama; "Pembroke" (1894); "Madelon" (1896); "Jerome, a Poor Man" (1897); "Silence, and Other Stories" (1898); "The Love of Parson Lord" (1900); "The Portion of Labor" (1901); "Understudies" (1901); "The Wind in the Rose Bush" (1903); "The Givers" (1904); and "By the Light of the Soul" (1906).

**Wilkinson, James,** an American soldier; born in Benedict, Md., in 1757. He became colonel in the Revolutionary army, went to Kentucky, served in the Indian wars (brigadier-general, 1792), and in 1796-98 and 1800-12 was commander-in-chief of the army. In 1813 he was placed in command of the Canada expedition, but in 1814 was superseded, and in 1815 was retired. In 1811 he was tried by court-martial on charges of having received bribes from Spain and aided in the plans of Aaron Burr (*q. v.*). Although he was then acquitted, later investigations have fully established the facts of his double-dealing. He died near the city of Mexico, Dec. 28, 1825.

**Wilkinson, Sir John Gardner,** an English Egyptologist; born in Haxendale, England, Oct. 5, 1797; was educated at Harrow and Exeter College, Oxford, and afterward resided 12 years in Egypt. As the result of his investigations there he published the "Manners and Customs of the Ancient Egyptians" (5 vols. 1837-41). His other works include: "A Handbook for Travelers in Modern Egypt" (1847); "Dalmatia and Montenegro" (1848); "A Popular Account of the Ancient Egyptians" (1853); and "The Egyptians in the Time of the Pharaohs" (1857). He died in Llandovery, Wales, Oct. 29, 1875.

**Wilkinson, William Cleaver,** an American educator; born in Westford, Vt., Oct. 19, 1833; was graduated at the University of Rochester (1857) and Rochester Theological Seminary (1859); was pastor of a Baptist church in New Haven (1859-61) and of another in Cincinnati (1863-66). In 1872-81 he was professor of homiletics and pastoral theology at Rochester Theological Seminary, and in 1892 he became professor of poetry and criticism at the University of Chicago. Among his works are: "The Dance of Modern Society" (1868); "A Free Lance in the Field of Life and Letters" (1874); "The Baptist Principle" (1881); "Webster: An Ode" (1882); "Poems" (1883); "Edwin Arnold as Poetizer and Paganizer" (1885); "The Epic of Saul" (1891); "The Epic of Paul" (1898); "The Epic of Moses" (1903); and "Modern Masters of Pulpit Discourse" (1905).

**Will,** in law, the declaration, in proper form, of what a man wills to be performed after his death; usually spoken of as the "last will and testament." Testaments are of very high antiquity, being in use at least as early as the time of the patriarchs;

for we are told that Jacob bequeathed to his son Joseph a portion of his inheritance doubly that of his brethren. Solon is said to have been the first legislator that introduced wills into Athens. In England the power of bequeathing is coeval with the first rudiments of the law, for we have no traces or memorials of a time when it did not exist. But this power of bequeathing did not originally extend to the whole of a man's personal estate, for we are told that by the common law, as it stood in the reign of Henry II., a man's goods were to be divided into three equal parts, of which one went to his heirs or lineal descendants, another to his wife, and the third was at his own disposal. If he died without a wife or without children, then the half was at his own disposal — the other half going to them; if neither wife nor issue, then he might dispose of the whole. This continued to be the law of the land down to the reign of Charles I.; but since that time it has changed by imperceptible degrees, till now the deceased, by will, may bequeath the whole of his goods and chattels. Formerly, in England, a will might be either written or verbal, but by statute 1 Vict. c. 26, verbal wills have been rendered altogether invalid, except as to "any soldier in actual military service, or any mariner or seaman, being at sea," who may dispose of personal estate the same as before the act.

The statutes of most of the American States have either placed nuncupative wills under special restrictions, or else reduced them within the same narrow limits as the English statutes. In many of the States they still exist much as they did in England before the above-quoted statute, being limited to a small amount of personal estate. Leaving aside this unimportant exception, it may be said that all wills, whether of real or personal estate, must be in writing, and signed at the foot or end thereof by the testator, or by some person in his presence, and by his direction, in the presence of two witnesses at least, who must subscribe and attest the will in his presence. The signature must be so placed at, after, following, under, or beside or opposite the end of the will, that it shall be apparent on the face of the will that the testator intended to give effect by such his signature to the writing signed as his will. In general, all persons who have sufficient understanding are capable of disposing by will of both real and personal estate; but no will made by any person under the age of 21 is valid; neither can a married woman make a will except of the property settled to her separate use. Lunatics, idiots, persons under undue influence, or under duress, are incapable to execute a will.

A will is a revocable instrument, and is revoked by marriage either in the case of a man or woman, but it is not revoked by any other change of circumstances. It may, however, be revoked by another will or codicil subsequently executed, or by a writing declaring the intention to revoke, or by burning, tearing, or otherwise destroying the will with the intention to revoke it. A revoked will may be revived by reëxecution, or by a codicil showing an intention to revive it. No obliteration, interlineation, or any other alteration in a will, is valid, except so far as the words or effect of the will before the alteration shall not be apparent unless with such alteration. But if the signature of the testator and subscribing witnesses be made in the margin opposite or near the alteration, or at the foot or end, referring to the alteration, it will be valid. A will takes effect as if executed immediately before the testator's death, unless the contrary intention be shown by the will; and lapsed and void devices fall into the residue unless the will shows a contrary intention.

**Will,** a mental phenomenon of which there are recognized three orders or classes: Cognition, feeling, and will. The first includes all the ways in which facts and relations become known; the second refers to the way in which the mind is affected as regards pleasure and pain; to the third, or will, belong all those mental states in which the mind or subject is regarded as producing changes either in the state of mind itself or in its bodily environment. The movements thus produced are called voluntary, and the mental acts producing them volitions. The term will may thus be said to refer to the active side of mind. But to make this clear the term "action" needs limitation. It does not refer to what we know as action in the physical world — *e. g.*, the action of a billiard cue on the ball: psychologically this process is for us only a certain orderly change of presentations. Further, many of our organic actions and bodily movements are not actions in the psychological sense of the word, seeing that they are not mentally initiated. Spontaneous, reflex, and instinctive actions, even when accompanied by a mental element — sensation or feeling — can be traced solely to certain organic conditions, and do not proceed from a mental initiative; the movement has not been preceded by an idea of the movement. In this way we reach a mark of distinction between the non-voluntary and the voluntary. In volition the movement is preceded by an idea of its "end"; and this end is further so connected with the emotional nature of the subject that its attainment gives satisfaction or pleasure, and the failure to attain to it is the cause of dissatisfaction or pain. Hence also the mental changes which do not possess these characteristic marks, but are

due to the occurrence of new sensations or to the mechanism of association, belong to the class of the non-voluntary.

If an act of will be allowed to involve both an ideal element and an element of feeling, it follows that the phenomena of will cannot be marked off as an entirely distinct class from those of cognition and feeling. Elements from the latter enter into and go to determine the nature of volition. Various attempts have been made by psychologists to account for the phenomena of volition without admitting any will element as an ultimate constituent of consciousness. Sometimes these theories have been mainly physiological in nature; but as such they go no further than to trace the development of the organic processes which accompany volition. A psychological account of volition which denies its ultimate character traces it either to presentation, or feeling, or to their combination. On the other hand, those psychologists who contend for the ultimate character of the will element in consciousness need not be satisfied with pointing out the difficulties which opposed theories fall into. They may contend that the will element is assumed by them at starting along with their conception of presentation and of a complex of presentations.

The question is thus apt to fall back on the still more fundamental question as to whether a presentation *per se* is intelligible. If we may assume that a presentation which is presented to no one, or is the object of no subject, is an impossible beginning for mental development, then with presentations we must assume a subject to which they are presented. It is admitted that such cognitive processes as reasoning and perception involve will; and it is contended by some that even in presentation the subject is not to be regarded as entirely passive, but is to be looked on as reacting upon the presentation in attending to it. Hence those psychologists who hold to the view that there is a will element in consciousness equally ultimate with the cognitive element and the feeling element, also frequently look on attention as the expression of that element, and on the "movements" of attention, or its continuous redistribution over the content of consciousness, as the fundamental act of will. And in this connection it may become apparent that the psychological question runs into and involves a philosophical view of the subjective activity to which simple presentation as well as rational choice is due. From this point of view also we see how will has come to be specially identified with the self or person, so as to admit of its being said that the will is the man.

The disputed questions concerning the mode of voluntary action have been generally discussed either as a part of, or in more or less express connection with, the time-honored controversy concerning the freedom of the will. This controversy arose out of ethical and, still more, theological discussions, rather than from purely psychological analysis. The way for the question was opened by Aristotle's investigation of the opposition between the voluntary and involuntary, and by his criticism of the older Socratic position that good only is voluntary and evil involuntary. By the application subsequently of the Stoical doctrine of a universal necessity or fate to the question of human volition a further step was taken toward opening up the controversy which has to so great an extent dominated modern psychology and ethics. Christian theology introduced alongside of the traditional philosophy of Greece a new conception of the relation between God and man, with the attendant conceptions of sin and grace. And from this new conception there soon emerged a twofold drift of thought, according as emphasis was laid on the holiness or on the power of God. From the former point of view it was necessary to free the conception of God from the stain of the evil in the world, and especially in human conduct; and accordingly a certain independence, a power of disobeying the divine law or of sinning, was attributed to the human will. In this way the "freedom of the will" came to be defended by early Christian writers (*e. g.*, Justin Martyr, Tertullian) against the fatalism which traced both good and evil to God. On the other hand, the conception of the divine omnipotence dominated the Christian philosophy of St. Augustine.

The Christian doctrine of salvation was made to hinge not on the individual will, but on the divine grace which freely elects to salvation and leads the wills of the elect from sin to repentance, faith, and holiness. This theory of predestination was afterward more strictly formulated by Calvin, and through his influence became the creed of the Reformed churches. It is noticeable, however, that St. Augustine, if not Calvin also, seeks to defend the justice of God by ascribing free will to Adam, who, as progenitor and representative of the human race, is represented as having lost the power to will the good, and — for himself and his descendants — come under the sway of evil till drawn from it by irresistible grace. The arguments drawn from the theory of predestination for the most part hold with equal force against free will before or after the fall, and in one of the ablest treatises against the common notion of the freedom of the will, that by Jonathan Edwards, the arguments adduced are quite general in their application. The free will controversy, as discussed between Augustine and

Pelagius, has revived with each new discussion of dogmatic theology; and from theology the metaphysical and psychological questions involved have passed into the schools of philosophy. Thus from Descartes to Lotze there is hardly a great thinker who has not attempted on one side or the other, or by way of compromise, to solve the question. The psychology of the question has been discussed with great fullness by the English and Scottish psychologists. While Reid, Stewart, Hamilton, and H. L. Mansel maintain the doctrine of free will, the theory of necessity — or, as they mostly prefer to call it, determinism, emphasizing thus the observed invariable sequence of act on motive rather than any necessary connection between them — is supported by Hobbes, Hume, Priestley, James Mill, J. S. Mill, and Bain. The view of Locke, as expressed in his subtle but intricate chapter on "Power" in the "Essay," is that the will, or rather the man, is moved to act by the most pressing uneasiness; and his theory would therefore be called determinist did he not subsequently assert that, in order to prevent precipitate determination, "we have a power to suspend the prosecution of this or that desire," and that "in this seems to consist of that which is (as I think, improperly) called free will."

The clearest view of the whole controversy may perhaps be obtained by passing shortly in review J. S. Mill's discussion of the subject in his "Examination of Sir W. Hamilton's Philosophy." The meaning of his doctrine is first explained. To begin with, he argues that determinism does not imply materialism; man may be a spiritual being, but yet subject to the law of causation, "his volitions not being self-caused, but determined by spiritual antecedents (*e. g.*, desires, association of ideas, etc., all of which are spiritual if the mind is spiritual) in such sort that when the antecedents are the same the volitions will always be the same." Further, he contends that determinism does not mean fatalism; neither the pure or Asiatic form of fatalism which holds that our actions do not depend on our desires, but are overruled by a superior power, nor the modified form of fatalism which "holds that our actions are determined by our will, our will by our desires, and our desires by the joint influence of the motives presented to us and of our individual character, but that, our character having been made for us and not by us, we are not responsible for it, nor for the actions it leads to, and should in vain attempt to alter them." The "true doctrine of the causation of human actions" rejects this conclusion, and maintains "that not only our conduct but our character is in part amenable to our will," and "that we can by employing the proper means improve our character." The "necessity" involved in human action simply comes to this, that any one who "knew perfectly our character and our circumstances" could predict our actions.

The arguments for this theory of determinism may be reduced to two: that from the universality of the connection between cause and effect, and that from the constant presence of motives in volition. The theory of determinism inferred, by Mill and most English psychologists, from these considerations, is that the action is the outcome of motives, the weight or strength of motives being further determined by their pleasure value — that is to say, from the point of view of feeling alone. It is noticeable, however, that a very different, though still determinist, theory of volition has been elaborated by Herbart. His psychology, in spite of the widely different philosophical principles from which it starts, has many points of similarity with that of the English Associationists; but his treatment of volition differs from theirs by attributing the motive force which governs action not to pleasure and pain, but to presentations themselves, from the interaction of which volition is held to be a special development. Whereas Mill looks upon will as issuing from desire, and desire as a conscious tendency toward pleasure — a view expressed by the old dictum, *nihil appetimus nisi sub specie boni* — the Herbartian psychologist put forward a view of will which disconnects it from the representation of an object as pleasurable.

On the other hand, the arguments for the theory of free will may also be reduced to two: the argument from the consciousness of freedom, and the moral argument. Regarding the argument from consciousness Mill says that "to be conscious of free will must mean to be conscious before I have decided that I am able to decide either way." And this power he denies on the ground that "consciousness is not prophetic"; "consciousness tells me what I do or feel. But what I am able to do is not a subject of consciousness." We may have a conviction afterward that we could or should have chosen the other course, but only by supposing "a difference in the antecedents. We picture ourselves as having known something which we did not know, which is a difference in the external inducements, or as having desired something or disliked something more or less than we did, which is a difference in the internal inducements." The moral argument, so far as it refers to the connection between freedom and responsibility, is also dealt with by Mill. Moral responsibility, he contends, does not imply freedom, for "responsibility means punishment." Punishment is a motive to action, and "proceeds on the assump-

tion that the will is governed by motives." The consciousness of "deserving punishment" which is, he adds, bound up with the feeling of responsibility, "is nothing else than our knowledge that punishment will be just"—*i. e.*, fitted to prevent us from infringing the rights of others. It is on these latter points that Mill's views may most probably seem insufficient. With regard to the consciousness of freedom, so careful an observer as Sidgwick gives a different interpretation of the facts. "In the case of actions," he says, "in which I have a distinct consciousness of choosing between alternatives of conduct, one of which I conceive as right or reasonable, I find it impossible not to think that I can now choose to do what I so conceive, however strong may be my inclination to act unreasonably, and however uniformly I may have yielded to such inclinations in the past. The belief seems to me bound up with the belief that I ought, in the strictest sense, to choose any course." And Mill's explanation of responsibility, and of the connected notion of moral obligation, is not so much a justification of these notions as the construction of a new meaning for the old words which may serve all social requirements. The ordinary notion of moral responsibility seems to involve the recognition of a law as binding on conduct, or of an ideal which ought to be realized in it; even apart from consideration of the punishment which may follow a breach of the law or disregard of the ideal.

The ethical aspect of the question of free will thus becomes apparent. It is most pronounced in the system of Kant, in which the free will comes to be identified with the moral law itself. On the other hand, Sidgwick maintains that, while the ordinary notions of moral obligation and moral responsibility imply the conception of free will, the content of morality is independent of it, that no decision on the question is required before deciding what it is right or reasonable to do in any circumstances, and that the freedom of the will is therefore not a necessary postulate of ethical theory. Some idea of the different ways in which the question of free will enters into philosophical construction of things, and of the different solutions of which it is capable, may be given by indicating very briefly the way in which it was dealt with by three philosophers who may be selected as typical of different modes of thought — Spinoza, Kant, and Lotze. Spinoza decides the question from the point of view of a monistic conception of things — *i. e.*, he conceives the universe as one and manifesting a single necessary law in its various modes. There is therefore no such thing as contingency either in man or nature. Belief in free will is simply a result of ignorance. Men think themselves free because conscious of their actions, but ignorant of the causes of these actions. Kant's treatment of the question is an attempt to reconcile determinism with freedom. The causality of nature which binds effect to cause in unbroken chain must be recognized to hold not only of the physical world, but also of the mental sequence of motive, desire, and act. But while this conception rules our experience, it is still possible to look on the whole series of sense phenomena — *i. e.*, the whole causality of nature — as itself an effect of the causality of freedom.

This idea is indeed only a regulative idea giving method and plan to our knowledge and not entering into knowledge. Further importance is given to it, however, when we enter on ethical considerations. The moral law, which requires absolute obedience, implies (unless our nature contradict itself) that such obedience can be rendered. Free will thus implied by the moral law would conflict with the causality of nature if conceived of as operating in time. It is only thinkable as the law of an intelligible world, and as thus at once reason, law, and will. Will is therefore free not only because above the causality of nature, but because it is autonomous or a law to itself. The weakness of this theory, however, lies in the opposition between the intelligible and sensible worlds. Kant has no means of showing how intelligible freedom may manifest itself in the development of actual character. He asserts at once the constancy of causal connection and the ethical world of free will; but no real harmony between the two is brought about. To hold fast the conception of law in mental phenomena — which recent psychology has made increasingly manifest — and at the same time to assert and harmonize with it the rational conviction that a place must remain for freedom, is the endeavor of Lotze. Volition, he contends, contains a peculiar element of mental activity not derived from presentation or feeling, though dependent on them for its appearance. "Will can have no content other than that supplied by the involuntary flow of ideas and feelings," but "we are convinced that we meet with an act of will only where the impulses urging to action are apprehended in distinct consciousness, and where the decision whether they shall be followed or not is deliberated on and is left to be determined by free choice of the mind."

**Willamette River,** a river in Oregon, rises in Lane county, and flows into Columbia river, 8 miles below Fort Vancouver, after a N. N. W. course of 200 miles, of which it is navigable for large vessels 15 miles to Portland, and above the falls for small steamboats about 60 miles. The valley of the Willamette is very fertile and pictur-

esque, and is usually styled the "garden of Oregon."

**Willamette University,** a coeducational institution in Salem, Or.; founded in 1844, under the auspices of the Methodist Episcopal Church; has productive funds exceeding $150,000; grounds and buildings valued at over $315,000; scientific apparatus, etc., $5,000; volumes in the library, about 8,000; average number of faculty, 45; average student attendance, 420; graduates, over 900.

**Willard, Emma (Hart),** an American educator; born in Berlin, Conn., Feb. 23, 1787. She did much for bettering the education of women. Her books, educational and general, include: "A Plan for Improving Female Education" (1819); "A History of the United States" (1828); "Poems" (1830), containing the popular song "Rocked in the Cradle of the Deep"; "Journal and Letters from France and Great Britain" (1833); "Universal History" (1835); "Respiration and its Effects"; and "Morals for the Young" (1857). She died in Troy, N. Y., April 15, 1870.

**Willard, Frances Elizabeth,** an American temperance reformer; born in Churchville, near Rochester, N. Y., Sept. 28, 1839.

FRANCES WILLARD.

Her early education was received at Oberlin College, and her parents removing to Illinois she was graduated at the Northwestern Female College at Evanston, Ill., in 1859. After some years spent in teaching she became Professor of Esthetics in the Northwestern University, and was made president of the Woman's College in February, 1871. She began her active temperance work in 1874, and was made secretary of the National Woman's Christian Temperance Union. In 1879 she was made president of that organization and held the office till her death. She was chosen as president of the World's Woman's Christian Temperance Union in 1888, and in 1892 visited England as the guest of Lady Henry Somerset, the well-known temperance worker. During her visit in London she addressed a mass meeting at Exeter Hall which was said to be the largest and most intensely interesting assemblage ever held in its walls. She was an untiring worker and for 10 years averaged one public meeting a day, besides writing letters and articles, and planning work while in transit between towns at which she spoke. She was editor-in-chief of the "Union Signal" from 1892, and a frequent contributor to other periodicals and newspapers, being an admirable writer and a journalist of rare tact, quickness and force. She was an orator of great eloquence, humor, and power. Her executive ability and genius for organization were wonderful and her work for temperance and social purity will live in the history of her country. She died in New York city, Feb. 18, 1898.

**Willcoxite** (after Col. Joseph Willcox), a talc-like mineral occurring as a coating on corundum, and probably resulting from its alteration. Color, white to greenish or grayish-white; luster, pearly. Composition: A silicate of alumina, magnesia, soda, potash, sesquioxide and protoxide of iron.

**Willetpoo.** See CAYUSE.

**Willemite,** or **Wilhelmite,** a native anhydrous silicate of zinc, found crystallized, granular, and massive, at Vieille Montagne, near Aix-la-Chapelle.

**Willems, Jan Frans,** the "father of the Flemings"; born in Bouchout, near Antwerp, Belgium, March 11, 1793. As a lad he took part in the Mysteries acted by the Lierre *Rederijkern.* His thoughts were thus turned to poetry, and two years after his entering the office of an Antwerp notary he won a prize for the best poem on the battle of Friedland and peace of Tilsit (1811). His ode "Aen de Belgen" ("To the Belgians" 1818), hailing the revival of Belgian nationality under Holland's protection, was coldly received by his countrymen, but earned him a post under the Dutch government, while a series of masterly philological works, including "Over de Nederduitsche Taal en Letterkunde" (2 vols. 1819–1820), procured him admission to the Academy of Antwerp. Degraded by the new Belgian government of 1830 to a petty office at Encloo, Willems labored there on the Flemish version of "Reynard the Fox," in his edition of it (1834) calling on Flemings to help to preserve their ancient tongue. As archivist of Ghent from 1835 he edited the "Rymkronyk van Fan van Helu" (1836), "Brabantsche Yeesten" (1839–1843), etc., and after his death at Ghent, June 14, 1846, appeared his collection of old Flemish songs, and his "Mengelingen van Vaderlandschen Inhond."

**Willet,** the *Symphemia semipalmata,* a species of grallatorial or wading birds, allied to the *Scolopacidæ* or snipes, and inhabiting the New World. They inhabit the N. regions in summer, and migrate S. in winter. The average length is 15 inches; the general color greyish brown above and white beneath. The wings are long and powerful,

and the toes partially webbed — a feature from which the specific name "semiparmata" has been derived.

**Willet's Point,** an American military reservation on Long Island Sound; 20 miles N. E. of the Battery, New York city, and opposite Fort Schuyler. It contains 136 acres which were purchased by the government in 1857 and 1863. The original intention was to build a powerful fort here to reënforce Fort Schuyler in the defense of the E. entrance to New York harbor; but on account of the changes made in the methods of attack and defense during the Civil War the work was left unfinished. In 1864 the Grant General Hospital and numerous temporary structures were built here, and at the close of the war a station for experiments with torpedoes, a depot for materials and stores, and a school of practice were established. The present school was organized in 1885. Its staff comprises a commandant three company commanders, a battalion adjutant, and a quartermaster. The adjutant acts as secretary to the staff and the quartermaster is instructor in military photography. The students comprise from 10 to 16 lieutenants of engineers and from 7 to 10 lieutenants from other branches of the service, and all take a special course in torpedo practice covering two and a half years. The other student officers are sent here after a certain length of service with their commands and remain for 10 months. The non-commissioned officers and privates at the school number from 350 to 400, and study tactics, the handling of torpedoes, photography, etc.

**William I.,** the Conquerer, King of England, the natural son of Robert, Duke of Normandy; born in Falaise, in 1027. He was brought up at the court of the King of France, and succeeded to the duchy at the age of eight. But during his minority there were frequent revolts of the nobles, and his authority was not fully established for many years. On the death of Edward the Confessor, King of England, William made a formal claim to the crown, alleging a bequest in his favor by Edward, and a promise which he had extorted from Harold. His claim being denied, he at once prepared for an invasion of England; effected a landing at Pevencey, Sept. 28, 1066, while Harold was engaged in opposing the Norwegians in the N., and fortified a camp near Hastings. The decisive battle of Hastings was fought on Saturday, Oct. 14, 1066; Harold was defeated and slain, and the Norman Conquest was commenced. His rival, Edgar Atheling, was supported by some of the leading men for a short time; but they all made submission to William at Berkhamstead, and on the following Christmas day he was crowned at Westminster by Aldred, Archbishop of York. He reigned with great tyranny; in consequence of which several insurrections took place, and were not quelled till the conqueror had depopulated different districts by fire and sword. He then divided the lands of most of the nobility and gentry among his followers. He also introduced the language of the North of France (called in England the Norman language), and ordered that all law pleadings and statutes should be in that tongue. To prevent nightly meetings and conspiracies, he instituted the curfew, or "cover-fire bell," at the sound of which every night, at eight o'clock, all fires and candles were to be put out. A survey was made of all the lands in the kingdom, the account or register of which was called the "Domesday Book." In 1078 he finished the Tower of London; in 1087 he attacked and destroyed the city of Mantes. He was about to march toward Paris, but died in Rouen, Sept. 9, 1087.

**William II.,** usually called Rufus; born in Normandy in 1056, the son of the Conqueror, and crowned on the news of his

WILLIAM RUFUS.

father's death reaching England, in 1087. He made a conquest of a part of Wales, and obtained the duchy of Normandy from his brother Robert, in 1095. He was a great persecutor of the clergy, and banished Lanfranc, Archbishop of Canterbury, from the kingdom. William was, according to the monkish chronicles, accidentally slain by an arrow, shot by Sir Walter Tyrrel, as he was hunting in the New Forest, Hampshire, Aug. 2, 1100.

**William III.,** of Nassau, Prince of Orange and King of England; born in The Hague, Holland, Nov. 14, 1650; was the son of William, Prince of Orange, and Mary, daughter of Charles I. He married the Princess Mary, daughter of James II., then Duke of York, and became stadtholder of Holland in 1672. He was also nominated general of the troops of Holland against Louis XIV., and made a vigorous resistance to the French armies under Luxembourg, whom he defeated in 1674; but was repulsed in his turn by the Prince de Condé. In

1688 the arbitrary measures, both against the established religion and the constitution, of James II., induced many nobles and others to invite the Prince of Orange to take possession of the English crown. He embraced the occasion, and landed without opposition at Torbay, the same year. James, finding himself unsupported, withdrew to France, and William took possession of his throne, in conjunction with his wife, the

WILLIAM III. OF ENGLAND.

daughter of that unfortunate monarch. His coronation as King of England took place in 1689. The year following William went to Ireland, where he defeated James at the battle of the Boyne. In 1691 he headed the confederate army in the Netherlands, took Namur in 1692, and in 1697 was acknowledged King of England by the treaty of Ryswick. On the death of Mary in 1694, the Parliament confirmed to him the royal title. His death was owing to a fall from his horse, by which he broke his collar bone, March 8, 1702.

**William IV.,** King of England; born in London, Aug. 2, 1765; the third son of George III. In his 15th year he entered the royal navy, and in 1780 was with Admiral Rodney when the latter defeated a Spanish squadron off Cadiz, and afterward proceeded to the relief of Gibraltar. Prince William subsequently held the command of a vessel of war in various parts of the world, but retired from active service in 1790. On the death of his brother, George IV., in 1830, he became King of England, and ruled till 1837. At his death, the Princess Victoria, daughter of his brother, the Duke of Kent, became Queen of England. He died in Windsor, June 20, 1837.

**William I., Emperor of Germany, and King of Prussia,** son of Frederick William III., by Princess Louise of Mecklenburg-Strelitz, and brother of Frederick William IV.; born in Berlin, March 22, 1797, received a military education, and took part in the campaigns of 1813 and 1815 against France. In 1840 he was appointed governor of Pomerania, which post he held till the revolution of 1848, when he sought refuge in England. He was elected a member of the Constituent Assembly in May of the same year, when he returned to Berlin. In 1849, as Commander-in-Chief of the Prussian army, he acted against the revolutionary Badeners; and in 1858, on the lunacy of his brother, the king, becoming manifested, Prince William was appointed regent. This position he occupied till Frederick William's death, in 1861, when he succeeded to the throne, crowning himself with his own hands, at Königsberg, on which occasion he emphatically asserted the doctrine of the "divine right of kings." Actuated by this spirit, and selecting as his ministers men of well-known reactionary principles, of whom the chief was Count Bismarck, William speedily embroiled himself and government with the liberal parliamentary body of that day; and this to so critical a degree, after the accession of Bismarck to the premiership in 1862, that the rupture threatened to end in revolution or civil war. A diversion from this state of things was, however, happily effected by the war which Prussia, conjointly with Austria, declared against Denmark. In 1866, war was next declared by Prussia against her old ally, Austria; and after a short campaign, in which the king and the royal princes took part, Austria was compelled to make a humiliating peace. The terrible effect of the needle gun created quite a panic in the Austrian army, and her generals found it would be useless to prolong the struggle. By this war Prussia obtained supremacy in Germany. In July, 1870, the Emperor Napoleon III., taking umbrage at Prussian interference with the succession to the vacant Spanish throne, or prompted by other motives, rashly declared war against Prussia, a power long prepared for such a contingency. On this, William, forming an alliance with the South German States, and constituting himself Commander-in-Chief of the united German armies, crossed the Rhine, and in a short but brilliant campaign, defeated the French in a series of battles, took Napoleon and his principal commanders prisoners, and received the capitulation of Paris, in February, 1871. Peace was finally declared by a treaty entered into at Versailles, by which Prussia acquired the province of Alsace, part of that of Lorraine, including the city of Metz, along with a war indemnity of $1,000,000,000. His success in the war with France led to an offer from the German States of the imperial crown of Germany, which he accepted. He was crowned Emperor of Germany at Versailles, Jan. 18, 1871. His 90th birthday was cele-

brated throughout Germany, March 22, 1887, and he died March 9, 1888. He was succeeded by his son Frederick, who was succeeded in the same year by his son William, as William II.

**William II.,** Emperor of Germany and King of Prussia; eldest son of Frederick III. and Victoria, princess royal of England; born Jan. 27, 1859; educated at Cassel and Bonn, married Augusta Victoria of Schleswig-Holstein-Augustenburg in 1881, and succeeded his father, June 15, 1888. After his accession he took an aggressive interest in social questions, and the strong initiative which he adopted in political affairs brought about the retirement of Prince Bismarck in 1890. He sent a congratulatory telegram to President Kruger when Dr. Jameson's force was defeated in December, 1895. In 1898 he paid a visit, with the empress, to Constantinople, where they remained some time as the Sultan's guests, afterward going to Palestine and Jerusalem. In 1902 he sent his brother HENRY, PRINCE OF PRUSSIA (*q. v.*) on a social visit to the United States, as his representative on the launching of his new yacht.

**William I.,** FREDERICK, King of Holland, Grank-Duke of Luxembourg, Prince of Orange and Duke of Nassau; born in The Hague, Aug. 24, 1772. He distinguished himself in the wars with the French republic, and became an exile with his father, the hereditary stadtholder of the Dutch republic, in 1795; after his father's death, he succeeded first to the duchy of Nassau, and joined the Prussian army against Napoleon. He became King of Holland by the settlement of affairs which followed the fall of Napoleon in 1814, the countries united under his rule by the Congress of Vienna being the old united provinces of Holland, the bishopric of Liège, and Belgium; the latter, however, was separated by the revolution of 1830. He abdicated in 1840, and died in Berlin, Dec. 12, 1843.

**William II.,** FREDERICK GEORGE LEWIS, son and successor of the preceding; born in The Hague, Dec. 2, 1792, distinguished himself in the peninsular war under Lord Wellington; he also commanded the army of the Netherlands at the battle of Waterloo. His reign commenced from his father's adbication in 1840. He died March 17, 1849.

**William III.,** ALEXANDER PAUL FREDERICK, son and successor of the preceding; born in The Hague, Feb. 19, 1817. His reign was chiefly distinguished by undertakings of internal improvement; and, under his rule, the kingdom enjoyed uninterrupted peace, and material prosperity increased. While Prince of Orange, William married, 1839, the Princess Sophia Frederica Matilda, daughter of the late King William I., of Würtemberg. They had two sons; William Nicholas Alexander Frederick Charles Henry, Prince of Orange; born in 1840, and William Alexander Charles Henry Frederick; born in 1851, and died in 1884, the last male heir of the house of Orange. William III. died at the Castle of Loo, Nov. 23, 1890.

**William I.,** surnamed THE LION, King of Scotland; born in 1143, a grandson of David I., and brother of Malcolm IV., whom he succeeded in 1165. Whence he derived his designation is one of the mysteries of history. His predecessors had long contested with the Kings of England the sovereignty of Northumberland and other districts of what is now the N. of England. Under Malcolm these claims were virtually abandoned and the King of Scots received, as a sort of equivalent for them the earldom of Huntingdon and other valuable estates. William had still, however, a hankering after the Northumbrian districts. He attended Henry of England in his continental wars, and is supposed, when doing so, to have pressed for a portion at least of the old disputed districts. In his disappointment he invaded them after the example of his ancestors. On July 13, 1174, he fell, near Alnwick Castle, into the hands of an English party. For security he was conveyed to Normandy, and there he consented, as the price of his liberation, to perform that homage for his kingdom which the English kings so long in vain attempted to exact from the government of Scotland. The treaty of Falaise, as the transaction was termed, from the place where it was adjusted, was revoked in the year 1189 by Richard I. of England in consideration of a payment of 10,000 marks, which he wanted for his celebrated expedition to Palestine. William had several disputes with the Church, but he was one of the early benefactors of the regular ecclesiastics, and founded in 1178 the great abbey of Arbroath, which he dedicated to Thomas Becket, slain eight years earlier. William died in Stirling in 1214.

**William I., of Nassau, Prince of Orange,** surnamed THE SILENT; the first leader in the Dutch war of independence; born in Dillenburg, Nassau, April 14, 1553, of Lutheran parents, but descended from the ancient counts of that principality. Being trained to political employments at the court of Charles V., he conformed outwardly to Catholicism, and had become governor of the provinces of Holland, Zealand, and Utrecht, while the re-

WILLIAM OF NASSAU.

formed doctrines were spreading, and events were ripening for the revolt of the Netherlands.

Philip II., King of Spain, having appointed Margaret of Parma a natural daughter of his father, Charles V., stadtholdress, with the Cardinal of Granville for her adviser, the latter began his career by persecuting the Protestants, and was preparing to introduce the inquisition, when, 1566, the nobles went in procession, and petitioned Margaret against this measure; and as they were treated with contempt, their remonstrances were followed by popular commotions. On this, Alva was sent, at whose approach 100,000 of the most industrious Flemings took refuge in foreign countries. This was the crisis at which William came forward, and raised the standard of independence. Though the cruel Alva was recalled at the end of six years, 1574, and replaced by a milder ruler, the Dutch continued the war, and Holland was liberated by the relief of Leyden, which William effected by laying the whole country under water in 1575. He was now elected stadtholder, and Calvinism became the established religion, to the exclusion of Lutheranism as well as the Roman Catholic faith. By the "Pacification of Ghent" in 1576, William united all the provinces in one confederation, but he found it impossible to heal these internal causes of disunion, and the Spaniards, taking advantage of them, were able to repossess themselves of the S. provinces, under the Duke of Parma, whence arose the present distinction between Holland and Belgium. Philip had now set a price on William's head, and in 1582, an attempt was made to assassinate him, but he recovered from the wound. A second attempt, in 1584, was but too successful. One Balthaser Gerard, being introduced to the stadtholder on the plea of business, suddenly drew a pistol loaded will three balls, and shot him in the body at Delft, July 10, 1584.

**William, Fort,** a fort of Scotland, one of a chain of three, erected to guard the Highlands, and originally built by General Monk, in the time of the Commonwealth. It had accommodation for 2,000 men, but is now disused. In the rebellion of 1715 the Highlanders were repulsed in an attack on it, and the fort, in 1746, stood a siege of five weeks by the Highlanders, adherents of Prince Charles Edward. About two miles distant, on the edge of Loch Linnhe, is the town of Fort William, originally Maryburgh, and now more generally Gordonsburgh. Pop. 1,500. Both fort and town lie at the base of Ben Nevis, the highest mountain in Great Britain.

**William and Mary College,** an educational non-sectarian institution in Williamsburg, Va.; second oldest college in the United States; chartered and opened in 1693; has productive funds exceeding $175,000; grounds and buildings valued at over $200,000; volumes in the library, about 20,000; average number of faculty, 25; average students, 240.

**William Henry, Fort,** a fort at the head of Lake George, N. Y.; in the town of Caldwell. It was taken from the English by the French and Indians under Montcalm, in August, 1757.

**William Jewell College,** an educational institution in Liberty, Mo.; founded in 1849 under the auspices of the Baptist Church; has an endowment exceeding $500,000; grounds and buildings valued at over $250,000; scientific apparatus, etc., $18,000; volumes in the library, about 20,000; average number of faculty, 45; average student attendance, 550; graduates, over 650.

**William of Malmesbury,** an English historian; born about 1095. He was librarian of the monastery at Malmsbury. He wrote: "History of the English Kings," and its continuation "Modern History," the two being the source from which all subsequent histories of England have drawn; "History of the Prelates of England"; "Lives" of St. Patrick, St. Dunstan, St. Wulfstan; several books of miracles; etc. He died in Malmsbury, about 1142.

**William of Newbury,** an English chronicler, one of the chief authorities for the reign of Henry II.; born in Bridlington, Yorkshire; lived from 1135 to 1200. His "History of Affairs in England" is divided into five books, extending from 1066 to 1198. It is clear, sound, and unprejudiced, the characters drawn with discrimination, and the narrative is especially valuable as an authority on the struggle between Becket and the king.

**William of Tyre,** a Syrian historian; born about 1137. He was Archbishop of Tyre (1175). He wrote "History of the Sovereigns of the East," and "History of Events in the Lands across the Sea," a fine record of the Crusades from 1127 to 1184, first printed in 1549. There are German and French translations of the latter.

**William of Wykeham,** an English statesman; born in Wykeham, Hampshire, England, in 1324. He received a liberal education from the lord of the manor of Wykeham, and was afterward recommended by him to the notice of Edward III. Having taken holy orders he was elevated to the rich see of Winchester, and in 1367 was appointed to the chancellorship of England. He founded (1373) a grammar school at Winchester, which still exists; and about the same time founded a college at Oxford, now called New College. In the last years of his life he rebuilt Winchester Cathedral. He died in 1404.

**Williams, Annie (Bowles),** an American juvenile story writer; born in Connecticut, in 1840. She published: "Birchwood"; "The Fitch Club"; "Professor Johnny"; "Rolf and his Friends"; "Who Saved the Ship?"; "The Giant Dwarf"; "The Riverside Museum."

**Williams, Arthur Llewellyn,** an American clergyman; born in Owen Sound, Ontario, Canada, Jan. 30, 1856; received an academic education and engaged in the railroad business in Colorado for several years; was graduated at the Western Theological Seminary, Chicago, in 1888, and ordained in the Protestant Episcopal Church in 1889; rector of St. Paul's Church, Denver, in 1891–1892, and of Christ Church, Chicago, in 1892–1899; and was consecrated Bishop-Coadjutor of Nebraska, Oct. 18, 1899.

**Williams, Mrs. Catharine R. (Arnold),** an American author; born in Providence, R. I., about 1790. She was the author of "Original Poems" (1828); "Religion at Home" (1829); "Tales, National and Revolutionary" (1830–1835); "Aristocracy," a novel (1832); "Fall River" (1833); "Biography of Revolutionary Heroes" (1839); and "Annals of the Aristocracy of Rhode Island" (2 vols. 1843–1845). She died in Providence, Oct. 11, 1872.

**Williams, Edward** (Iolo Morganwg), a Welsh poet; born in Llancarvan, Glamorganshire, in 1745; with Owen Jones and Pughe edited the "Myvyrian Archæology" (3 vols. 1801–1807), and himself published, among other works, "The Fair Pilgrim, a Poem Translated from the Welsh" (1792). To this he appended specimens of Druidical "Triads," which, after a long-protracted controversy and on the non-production of their MSS., are commonly looked on as a literary forgery. A friend of Southey, Williams by trade was a stone mason, and worked for some years in London, but died at Flemingstone, Glamorganshire, Dec. 17, 1826, leaving a posthumous Welsh work, "Secrets of the Bards of the Isle of Britain" (1829).

**Williams, Francis Howard,** an American dramatic writer; born in Philadelphia, Pa., in 1844. Among his plays are: "The Princess Elizabeth: A Lyric Drama"; "The Higher Education"; "A Reformer in Ruffles"; "Master and Man." He also wrote "Theodora: A Pastoral"; "Atman: A Story"; "The Flute Player, and Other Poems"; "Pennsylvania Poets of the Provincial Period."

**Williams, Sir George,** founder of the Young Men's Christian Association; born in Dulverton, Somersetshire, England, Oct. 11, 1821. In 1841 he went to London; gathered together the young men employed in the same establishment as himself, and on June 12, 1844, organized, with 12 of them a band called the "Young Men's Christian Association," which was designed to be "a society for improving the spiritual condition of young men engaged in the drapery and other trades." He was the first treasurer of the Young Men's Christian Association, and was always devoted to its interests. He was knighted in 1894; died Nov. 6, 1905. See Young Men's Christian Association.

**Williams, George Washington,** an American negro writer; born in Pennsylvania, in 1849. He served in the Federal Army in the Civil War; subsequently as an officer in the army of Mexico (1865–1867); and was minister to Haiti in 1885–1886. He wrote "History of the Negro Race in America"; "The Negro Troops in the War of the Rebellion"; "History of Reconstruction." He died Sept. 4, 1891.

**Williams, John** (pen name "Anthony Pasquin"), an English author; born in London about 1765. Because of his scurrilous political writings he was declared in 1797 to be "a common libeler," and soon after came to the United States. He was connected with the press, wrote several plays, also a volume of poems (1789); "Legislative Biography" (1795); "Life of Alexander Hamilton" (1804); and the "Dramatic Censor" (1811). He died in Brooklyn, N. Y., Oct. 12, 1818.

**Williams, John,** an English missionary; born in Tottenham, near London, England, June 29, 1796. At 14 he was apprenticed to an ironmonger, but having offered himself to the London Missionary Society, was sent in 1816 to Eimeo, one of the Society Islands. Later he settled in Raiatea, the largest of the group, and labored here with marvellous success, his powers of organization being as conspicuous as his zeal. In 1823 he went to Raratonga, the chief of the Hervey Islands, and ere long the whole group was Christianized. He next built a boat 60 feet long, and 18 feet wide, the sails of native matting, the cordage of the bark of the hibiscus, the oakum of cocoanut husks and banana stumps, and in this vessel during the next four years he visited many of the South Sea Islands, extending his missionary labors to the Samoa Islands. In 1834 he returned to England, and remained nearly four years, superintending the printing by the Bible Society of his Raratongan New Testament, and raising $20,000 to equip a missionary ship for Polynesia. He published his "Narrative of Missionary Enterprises" in 1837. In 1838 he went out again, visited many of the stations he had already established, and sailed as far W. as the New Hebrides, where he hoped to plant a mission, but was killed and eaten by the savage natives of Erromango, Nov. 20, 1839.

**Williams, John,** an American clergyman; born in Deerfield, Mass., Aug. 30, 1817; was graduated at Trinity College in 1835; traveled abroad and was ordained in

the Protestant Episcopal Church in 1841; was president of Trinity College in 1848–1853; and 1854 became dean of the Berkeley Divinity School in Middletown and held that post till his death. In 1865 he was consecrated Bishop of Connecticut. On the death of Bishop Southgate in 1894 he became the senior bishop of his Church. He was the author of "Thoughts on the Gospel Miracles" (1848); "Studies in the Book of Acts"; "The World's Witness to Jesus Christ" (1882); etc. He died in Hartford, Conn., Feb. 7, 1899.

**Williams, Sir Monier Monier-,** an English scholar; born in Bombay, India; Nov. 12, 1819; and was educated at King's College, London, and Balliol and University Colleges, Oxford, taking the Boden scholarship in 1843, and graduating B. A. in 1844. He was Professor of Sanskrit at Haileybury (1844–1858), and a master at Cheltenham (1858–1860), when he was appointed Boden Professor of Sanskrit at Oxford. He was knighted in 1886, at the opening of the Indian Institute established mainly through his energy. He died April 11, 1899.

**Williams, Oscar Fitzalan,** an American diplomatist; born in Livonia, N. Y., June 29, 1843; was graduated at Cornell University in 1869; engaged in teaching for 20 years; was consul to Havre, France, in 1889–1893. After the American-Spanish War he was active in the adjustment of the Philippine Islands to their new conditions. He was the last United States consul in Manila, having been appointed in 1897. On Jan. 4, 1901, he was made consul-general at Singapore, Straits Settlements.

**Williams, Roger,** the founder of the State of Rhode Island, and nobly distinguished as the first asserter in modern Christendom of the sanctity and perfect freedom of conscience; born in London, England, in 1607; studied at Oxford, entered the Church, and naturally joined the Puritan party. To escape the persecutions to which the Puritans were subject in England, he, like so many others, fled to America to find what was denied them there — freedom to worship God. He arrived at Boston, New England, in 1631, and holding already in perfect clearness the grand truth of which he was the first modern apostle, soon found himself in collision with the churches already existing there; for they still acted on the very principles of which they had been the victims at home. At length, in 1636, he was ordered to embark for England. To avoid this he left Salem in mid-winter, wandered houseless and half-fed for 14 weeks, then found friends and hospitality among the Indians, whose language he had learnt. He preached to them, won their love, and was their friend and peace-maker till his death. He had resolved on founding a new settlement, and after beginning to build and plant at Seekonk, had to abandon the spot, and selected Rhode Island, on which he landed from an Indian canoe, with five comrades, in June, 1636. He called the place "Providence," and commenced building. In the course of two years he was joined by others, and founded a commonwealth in the form of a pure democracy, and his system has had its influence on the whole political history of the State. He showed no spirit of revenge toward those who had persecuted him; and when the colonies were threatened with a general rising of the Indian tribes, he nobly risked his own life, and undertook the mission to the Narragansetts to dissolve the conspiracy; in which he succeeded. To secure the permanent existence of Rhode Island as a separate State, Williams was chosen to visit England in 1643, to obtain a charter. He was received with the greatest favor by the Long Parliament, and took back with him the desired charter. Williams refused the office of governor, to which the colony wished to appoint him; labored on for its good, rewarding himself in doing it; had a warm controversy with George Fox; and died in Providence in 1683.

ROGER WILLIAMS.

**Williams, Sir William Fenwick,** a British military officer; born in Annapolis Royal, Nova Scotia, Dec. 4, 1800; was graduated at Woolwich in 1821, and became a 2d lieutenant of artillery in 1825. After serving in the East Indies for several years he was appointed British commissioner to the conference in Erzeroum, to settle the boundary dispute between Persia and Turkey in Asia. During the Crimean War he was sent as commissioner to the relief of Kars, and there promptly reorganized the troops. After defending Kars for four months against the Russians he met their commander, General Mauravteff, at the head of a large force on the heights above the city and defeated him with great slaughter. Assisted by the Hungarian General Kmety, he did all in his power for the defense of Kars, but on Nov. 14 was forced to capitulate. When the war was over he returned to England, when he was created baronet and decorated with the ribbon of the order of Bath, received the rank of pasha of the highest order and

the decoration of the Medjidieh from the Sultan; and was made a grand officer of the Legion of Honor of France. In July, 1856, he was given command of the garrison at Woolwich, and was elected to Parliament from Calne. At the general elections in 1857 he was reëlected but retired in 1859, and assumed the command of the forces of British North America. He was administrator of Canada in 1860–1861; became full general in 1868; was governor-general of Gibralter in 1870–1875; retired from the army in 1877; and was appointed constable of the Tower in 1881. He died in London, England, July 26, 1883.

**Williams, Samuel Wells,** an American philologist; born in Utica, N. Y., Sept. 22, 1812. He assisted in preparing a Chinese, and afterward a Japanese, dictionary; was interpreter for Commodore Perry in Japan, 1853–1854; was secretary of legation in China, 1855–1857, and again 1862–1876. He was Professor of Chinese at Yale, 1876–1884, and was president of the American Oriental Society. He published: "Easy Lessons in Chinese" (1842), followed by "Chinese and English Vocabulary" (1843), and "Tonic Dictionary of the Chinese" (1874). His greatest work is "The Middle Kingdom" (1883), which has done excellent service in making Chinese history and conditions known to the public. He died in New Haven, Feb. 17, 1884.

**Williamsburg,** a city and county-seat of James City co., Va.; on the Chesapeake and Ohio railroad; 48 miles S. E. of Richmond. It was established in 1632, and is the oldest incorporated town in the State. Prior to the Revolutionary War it was the capital of the province; and was also the State capital till 1779. Williamsburg is the seat of WILLIAM AND MARY COLLEGE (*q. v.*), and the Eastern Lunatic Asylum, which was open in 1773, and is the oldest institution of its kind in the United States. The city has other historic interests. On May 3, 1862, when the Confederates withdrew from YORKTOWN (*q. v.*) they fell back to Williamsburg and erected breastworks about 2 miles E. of the city. The Union forces under General Sumner followed, and on May 5 assaulted the Confederate position. The action lasted from early morning till night. General Hancock won the day by pretending to retreat, and then charging the pursuing enemy, who were completely routed. The total loss of the Union forces was 2,283; that reported by the Confederates, 1,560. Pop. (1890) 1,068; (1900) 1,069; (1910) 2,714.

**Williams College,** an educational nonsectarian institution in Williamstown, Mass.; opened in 1793; has productive funds exceeding $1,500,000; grounds and buildings valued at over $1,300,000; scientific apparatus, etc., $80,000; volumes in the library, about 66,000; average number of faculty, 59; average student attendance, 540; graduates, over 5,000.

**Williamson, Alexander William,** an English chemist; born in London, England, May 1, 1824; studied at home, at Paris, and at Giessen; and in 1849 became Professor of Practical Chemistry at University College, London, as also in 1855 of Chemistry; he resigned in 1887. He was president of the Chemical Society and of the British Association; a corresponding member of the French and other foreign academies; F. R. S. and LL. D.; and received numerous medals and distinctions for his researches on etherification, gas analysis, the atomic theory, etc. He published many papers and lectures, and a well-known "Chemistry for Students." Died in 1904.

**Williamsport,** a city and county-seat of Lycoming co., Pa.; on the Susquehanna river, and on the Philadelphia and Reading, the Northern Central, the Pennsylvania, the Beech Creek, and the Fall Brook railroads; 94 miles N. of Harrisburg. It is a popular summer resort, surrounded by high hills and attractive scenery. Here are a United States government building, Dickinson Seminary for Girls, high school, public libraries, Home for the Friendless, hospital, street railroad and electric light plants, waterworks, National State, and other banks, numerous churches, and several daily and weekly newspapers. The river is here crossed by a great boom, that receives the timber logs from a vast forest territory along the Upper Susquehanna and its tributaries. The chief industry is the manufacture of lumber, carried on in 30 sawmills, and in lath, picket, shingle, sash, blind and door mills, etc. The other industries include rubber works, a silk mill, iron furnace, carriage factories, sewing machine works, paint, soap, glue, and furniture factories, etc. The assessed property valuation exceeds $9,000,000. Pop. (1890) 27,132; (1900) 28,757; (1910) 31,860.

**Willibrod.** See WILBROD.

**Willimantic,** a city of Windham co., Conn.; on the Willimantic river, and on the New York, New Haven, and Hartford, the New England, and the Central Vermont railroads; 32 miles S. E. of Hartford. It contains numerous churches, an academy, State Normal Training school, convent, Dunham Hall, public libraries, waterworks, electric lights, National and savings banks, and several newspapers. The river here falls 100 feet and affords abundant power. There are extensive manufactures of spool cotton, cotton, silk, and woolen goods, silk machinery, tinware, ironware, etc. The assessed property valuation exceeds $4,000,000. Pop. (1900) 3,186; (1910) 11,230.

**Willis, Nathaniel Parker,** an American author; born in Portland, Me., Jan. 20, 1806; was educated at Boston, Andover, and Yale College; employed by S. P. Goodrich (Peter Parley) to edit "The Legendary" (1828) and "The Token" (1829); established the "American Monthly Magazine," which was merged in the "New York Mirror"; traveled in France, Italy, Greece, European Turkey, Asia Minor, and finally England; returned to America in 1837, and afterward edited "The Home Journal." His numerous published writings include: "Pencillings by the Way" (1835); "Inklings of Adventure" (1836); "Loiterings of Travel" (1839); "People I have Met" (1850); "Famous Persons and Places" (1854); "Outdoors at Idlewild" (1854); "The Convalescent, his Rambles and Adventures" (1859). He died near Newburg, N. Y., Jan. 20, 1867.

NATHANIEL P. WILLIS.

**Willoughby, William Franklin,** an American economist; born in Alexandria, Va., July 20, 1867; was graduated at Johns Hopkins University in 1888; appointed expert in the United States Department of Labor in 1890; and in 1900 was chosen special agent on Education and Social Economy of the United States Commission to the Paris Exposition. While there he served as a member of the class, group, and superior juries, and received the decoration of the Cross of the Legion of Honor from the French government. He was also several times a representative of the Department of Labor at international congresses for the investigation of labor conditions in Europe; a member of the American Economic Society, a fellow of the Royal and American Statistical Societies, and a lecturer on economics at Johns Hopkins University. He was the author of "Workingman's Insurance" (1898).

**Willow,** any species of the genus *Salix;* used also in a more limited sense for any *Salix* which is not known as an osier or a sallow. Some of the willows in the limited sense furnish good timber. The Bedford willow, *S. russelliana,* a variety of *S. fragilis,* the crack willow or withy, is a tree sometimes attaining 50 feet in height and 12 in girth. It was first brought into notice by the Duke of Bedford, whence its name, and is very valuable for its timber, the bark containing much tannin, and a larger amount of salicine than any other of

WHITE WILLOW.

a, branch of male tree with flowers; b, branch of female tree.

the genus. Another valuable timber tree is *S. alba,* the Huntingdon or white willow. It is 80 feet high, with a girth of 20 feet. The timber is used for carpentry and for fuel, and the bark for tanning. It is common in America. In weaving, a machine for cleaning cotton, wool, or hemp; a devil.

**Willow Beauty,** a European geometer moth, *Boarmia rhomboidaria.* Wings grayish-brown, with a darker spot and lines. The caterpillar is very common in September on roses, plums, etc.

**Willow Gall,** a gall produced on willows by the puncture of a dipterous insect, *Cecidomyia strobilina,* in the leaf buds, which causes arrest of growth so that the stem scarcely develops, and the leaves are crowded together into a close rosette.

**Willow Grouse,** the *Lagopus albus,* from the N. portions of both hemispheres. It resembles the ptarmigan in plumage, and, like that species, becomes white in winter; called also white grouse and white ptarmigan.

**Willow Herb,** the genus *Epilobium* and specially *E. angustifolium;* called more fully the rosebay willow herb, or simply the rose bay. It is a tall undershrub, four to six feet high, with scattered lanceolate, or linear lanceolate, veined, glabrous, willow-like leaves, three to six inches long (whence its name), irregular, rose-purple flowers an inch in diameter. It is found by moist river sides and copses, chiefly in Scotland,

also on the continent of Europe, in temperate Asia, and North America. Ale and vinegar are made in Kamchatka from the fermentation of the pith dried and boiled; the young leaves are sometimes eaten, the mature ones are narcotic. From the scent of its flowers the plant is sometimes called apple pie.

**Willow Pattern,** a well-known pattern for stone and porcelain ware, generally executed in dark blue, in imitation of a Chinese design. The name is taken from a willow tree, which is a prominent object in the design.

**Willow Moth,** in entomology, the *Caradrina cubicularis,* a common European nightmoth, called by Newman the pale mottled willow moth. Fore wings ochery gray, with two dark spots on the costa; hind wings white, with a dark brown line on the posterior margin. The caterpillar, which is small at harvest time, becomes housed with the grain, the peas, etc., and doing immense damage. It changes to a chrysalis in May.

**Willow Oak,** in botany, the *Quercus phellos.* Leaves smooth, membranous, linear, lanceolate, pointed, entire; acorn roundish. A large tree with strong coarse timber, growing in swampy forests near the S. shores of the United States.

**Willow Wren,** or **Willow Warbler,** in ornithology, *Phylloscopus trochilus;* called also the willow warbler, and yellow wren, from the localities it frequents and the general color of its plumage. Length about five inches; dull olive-green on the upper part of the body; chin, throat, and breast yellowish-white; abdomen nearly pure white. In temperate climates the willow wren begins to couple about the end of April. The nest is placed on the ground, most commonly against a bank among long grass or weeds, but often at the foot of a bush, and, like that of the wood wren, is covered with a dome having a rather wide hole in the side, whence this species and its congeners are called "oven birds." The willow wren is a graceful, active bird, flitting restlessly from twig to twig, and the song is loud and sweet.

**Wills, William Gorman,** an Irish dramatist; born in County Kilkenny, Ireland, in 1830. He was the author of "Notice to Quit" (3 vols. 1861); "The Life's Evidence" (3 vols. 1863); and the dramas "Charles the First" (1872); "Eugene Aram" (1873); "Marie Stuart" (1874); "Jane Shore" (1876); "Olivia Sedgemoore" (1881); "Claudian" (1885); "A Royal Divorce" (1891); and, in conjunction with Sidney Grundy, "Madam Pompadour." He died in London, Dec. 14, 1891.

**Willughbeia,** or **Willoughbeia** (named by Dr. Roxburgh after Francis Willughby, F. R. S., naturalist, 1635–1672), the typical genus of *Willughbeieæ;* milky plants with opposite leaves and tendrils, and axillary and terminal cymes of flowers, with salver-shaped corollas. Fruit about the size of an orange, the pulp with many seeds enclosed. *Willughbeia edulis,* a large climber found in the forests of Chittagong, has eatable fruits . This species, and *W. martabanica* yield caoutchouc.

**Willughby, Francis,** an English ornithologist; born in Mollaton Hall, Nottinghamshire, England, in 1635; studied at Cambridge, where he became the pupil of the famous naturalist John Ray. He spent some time at Oxford, and then started on the memorable continental tour (1663–1664) with Ray, making studies and collecting zoölogical specimens. Ray edited and translated his "Ornithologia" (1676–1678) and edited his "History of Fishes" (1686). To the former Buffon and Linnæus were much indebted. He died July 3, 1672, from the effects of overstudy and hardship on a naturally weak frame.

**Wilmington,** a city, port of entry, and county-seat of New Castle co., Del.; at the junction of the Delaware, Christiana, and Brandywine rivers, and on the Wilmington and Northern, the Philadelphia, Wilmington, and Baltimore, and the Baltimore and Ohio railroads; 28 miles S. W. of Philadelphia. Wilmington is mostly situated on elevated ground, the thickest settled section being that between the Christiana and Brandywine rivers.

*Business Interests.*—There are three regular passenger and freight steamship lines to Philadelphia and the principal ports on the Atlantic coast. The chief manufactories include machine shops, foundries, paper and other machinery works, morocco leather factories, iron and steel works, slaughtering and meat packing plants, carriage and wagon shops, malt liquors, and cotton and paper mills. According to the United States census of 1900 there were 759 manufacturing establishments, employing $28,372,643 capital and 16,054 persons; paying $7,433,210 for wages and $19,451,815 for materials and having a combined output valued at $34,053,324. There are 5 National banks with a combined capital of about $1,220,000, and numerous daily, weekly, and monthly periodicals. The assessed property valuation is $40,000,000, and the total bonded debt, $150,000.

*Public Interests.*—The city has an area of 10 square miles, 94 miles of streets, of which 53 miles are paved; a sewer system covering 62½ miles; and a system of waterworks costing $1,600,000, with 100 miles of mains, and an average daily consumption of 6,685,000 gallons. The streets are lighted by gas and electricity at an annual cost

of over $45,500. The cost of the police department is about $80,000 per annum, and that of the fire department about $37,000. There is a public school enrollment of over 11,000 pupils, and annual expenditures for public education exceeding $386,000. The annual cost of the maintenance of the city government is about $813,500. Here are a United States government building, library, the Hebb School, Friends' School, high school, the Ferris Reform School, State Industrial School for girls, State Asylum for the Insane, the Delaware, Homœopathic, and County Hospitals, and the quarters of the State Historical Society.

*History.*— In 1638 the Swedes here built Fort Christiana. This was captured by the Dutch in 1655, and called Fort Altena, and the town was named Christianaham. In 1731 the village of Willingtown, named thus in honor of Thomas Willing, was founded. The name was subsequently converted into Wilmington. The place received its city charter in 1832. The Old Swedes' church, erected in 1698, is still used. Pop. (1890) 61,431; (1900) 76,508; (1910) 87,411.

**Wilmington,** a city, port of entry, and county-seat of New Hanover co., N. C.; on Cape Fear river, and on the Wilmington, Newbern, and Norfolk, the Wilmington Sea Coast, the Atlantic Coast Line, the Seaboard Air Line, and the Cape Fear and Yadkin Valley railroads; 214 miles N. E. of Charleston, S. C., and 26 miles W. of the Atlantic Ocean. It is the most important commercial port of the State. There are daily steamboat lines to Baltimore, Charleston, and points on the Cape Fear river. Here are a United States government building, a State armory, United States Marine Hospital, high school, the Gregory Normal Institute, waterworks, electric lights, street railroads, public library, National and State banks, and a number of daily, weekly, and monthly periodicals. The industries include the manufacture of cotton goods, lumber, flour, turpentine, fertilizers, guano, foundry products, etc. The assessed property valuation is over $7,200,000. In the fiscal year ending June, 1901, the exports aggregated in value $15,070, and the imports $180,912. During the Civil War the city was one of the chief ports of the Confederacy, and a notable resort for blockade runners, until captured by General Terry in 1865. Pop. (1890) 20,056; (1900) 20,976; (1910) 25,748.

**Wilmot, David,** an American jurist; born in Bethany, Pa., Jan. 10, 1814; was admitted to the bar in 1834; member of Congress in 1845–1851, being author in 1846 of the celebrated "WILMOT PROVISO" (*q. v.*). He was presiding judge of the 13th District of Pennsylvania; United States Senator in 1861–1863; and became a judge of the United States Court of Claims in 1863. He died in Towanda, Pa., March 16, 1868.

**Wilmot Proviso,** a notable resolution introduced into the United States Congress by David Wilmot, On Aug. 8, 1846, pending the consideration in Congress of a bill placing $2,000,000 at the disposal of President Polk to negotiate a peace with Mexico, David Wilmot, a representative from Pennsylvania, offered the following amendment: "Provided, that, as an express and fundamental condition to the acquisition of any territory from the republic of Mexico by the United States, by virtue of any treaty which may be negotiated between them, and to the use by the Executive of the moneys therein appropriated, neither slavery nor involuntary servitude shall ever exist in any part of said territory, except for crime, whereof the party shall first be duly convicted." This was the famous "Wilmot Proviso," which became the source of great agitation throughout the country. It was adopted in the House by a vote of 94 to 78, and was under debate in the Senate when the hour arrived previously fixed for the adjournment of the session. At the next session, Mr. Wilmot again introduced it, and a fierce and angry contest commenced. The House remained firm in favor of the amendment, and it was passed by a decided majority, but not acted on by the Senate.

**Wilson, Alexander,** a Scotch-American ornithologist; born in Paisley, Scotland, July 6, 1766. In early life he was a weaver and teacher. He published a volume of poems in 1790, but being sentenced for a lampoon in 1793, emigrated to America. He was employed as editor of the American edition of Rees's "Cyclopædia"; but in his wanderings as peddler, he learned to love birds, and set about writing an ornithology. At his death seven volumes of this work had been published; the eighth and ninth volumes were edited by George Ord, and a continuation by Charles Lucien Bonaparte (4 vols. 1825–1833). Volumes of his poems were published at Paisley in 1816, and at Belfast in 1857. He died in Philadelphia, Pa., Aug. 23, 1813.

**Wilson, Allen Benjamin,** an American inventor; born in Willet, N. Y., Oct. 18, 1824; was a cabinet maker by trade, but in 1849 invented a sewing machine which made a stitch at each movement of the shuttle, and thereafter devoted himself to its improvement. In 1851 he secured a patent for the rotating hook, and a year later invented the four-motion feed, which was subsequently adopted in all machines. On the completion of his sewing machine he entered into partnership with Nathaniel Wheeler, a practical manufacturer, and began to make his machine in a small shop in Watertown, Conn., but soon afterward removed to

Bridgeport, Conn., and there established the largest factory of its kind in the world. In 1852, however, on the reorganization of the firm he withdrew from the business and settled in Waterbury, where he engaged in other enterprises. He died in Woodmont, Conn., April 29, 1888.

**Wilson, Sir Archdale,** a British military officer; born in Didlington, Norfolk, England, in 1803. At 16 he entered the Bengal Artillery, to the luster of which he added at the siege of Bhartpur, the affair of Lahore, and the capture of Delhi. After the successive deaths of Generals Anson and Barnard, General Reed succeeded to the command at Delhi in 1857. Finding his health unequal to the strain, that officer made Wilson Brigadier-General, and resigned the command to his hands. That was at the time when the little British force on the Ridge was the besieged rather than the besiegers. What it wanted was a siege train of far-reaching guns. As an artilleryman Wilson saw this. Though naturally weighed down by a sense of his responsibility, Wilson had the merit to trust the two men who finally took Delhi — Col. Baird Smith (De Quincey's son-in-law) and Capt. Alec Taylor. Hence the substantial justice of Lord Canning's order when Delhi fell, "In the name of outraged humanity, in memory of innocent blood ruthlessly shed, and in acknowledgement of the first signal vengeance inflicted on the foulest treason, the Governor-General in Council records his gratitude to Major-General Wilson and the brave army of Delhi. He does so in the sure conviction that a like tribute awaits them, not in England only, but wherever, within the limits of civilization, the news of the well-earned triumph shall reach." He died, May 9, 1874.

**Wilson, Augusta Jane (Evans),** an American novelist; born near Columbus, Ga., about 1838. She lived some years in Texas; afterward at Mobile, Ala. Her works had great popularity. They include: "Inez" (1856); "Beulah" (1859); "Macaria" (1864); "St. Elmo" (1866); "Vashti" (1869); "Infelice"; and "At the Mercy of Tiberius." She died May 9, 1909.

**Wilson, Sir Daniel,** a Canadian educator; born in Edinburgh, Scotland, Jan. 5, 1816; received a classical education and on leaving college in 1837 went to London and there adopted literature and journalism as a profession. A few years later he returned to Edinburgh where he studied archæology; became secretary of the Scottish Society of Antiquarians and undertook the editorship of its "Proceedings." In 1853 he was made Professor of English Literature and History in University College, Toronto, where he remained till 1880, when he was called to the presidency of Toronto University. On the formation of the Royal Society of Canada in 1882, he was elected chairman of the section of History, Archæology, and English Literature; and succeeded to the presidency of the society in 1885. In 1888 he was knighted by the queen. Sir Daniel was also a fellow of the Royal Societies of Edinburgh, Italy, and Copenhagen; the founder of the Newsboys' Home in Toronto; chairman for several years of the Ontario Teachers' Association; president of the Young Men's Christian Association in Toronto; and the author of "Memorials of Edinburgh in the Olden Time"; "Prehistoric Annals of Scotland"; "Chatterton: a Biographical Study"; "Spring Wild Flowers"; and numerous contributions to periodical literature, etc. He died in Toronto, Canada, Aug. 7, 1892.

**Wilson** (Latinized, Volusenus), **Florence,** a Scotch theologian; born near Elgin about 1500; was educated at King's College, Aberdeen. Proceeding to England he obtained the favor of Cardinal Wolsey, whose nephew he accompanied to Paris as tutor. On the death of Wolsey (1530) he found another patron in the learned Cardinal du Bellay, Archbishop of Paris, and was finally appointed by Cardinal Sadolet master of the public school of Carpentras. While here he wrote his famous dialogue "Tranquillity of Mind" (1543), a monument of his classical erudition and the beauty of his Latin style. It contains several pieces of original Latin verse, which rival Buchanan's in elegance if not in strength. Wilson died in Vienne, Dauphiny, about 1547.

**Wilson, George,** a Scotch chemist; born in Edinburgh, Feb. 21, 1818; a younger brother of Sir Daniel Wilson. He attended the high school and university; was licensed as lecturer on chemistry in the Edinburgh College of Surgeons; afterward became a popular lecturer on chemistry in the School of Arts and in the Veterinary College; and in 1855 was appointed Professor of Technology in Edinburgh University. In conjunction with this office he was Regius Director of the Industrial Museum of Scotland, an institution which owes much of its completeness and order to his knowledge and skill. Among his scientific works were "Text-book of Chemistry" (1850); "Researches in Color-blindness" (1855); and "The Five Gateways of Knowledge" (1856), a delightful hymn or prose-poem of science. He died, Nov. 22, 1859.

**Wilson, Henry** (born JEREMIAH JONES COLBAITH), an American statesman; born in Farmington, N. H., Feb. 16, 1812; was mainly self-educated and learned the trade of shoe making. On attaining his majority he had his name changed by the legislature to that by which he was best known. He became an abolitionist in 1835; supported William Henry Harrison for the presidency

in 1840, speaking at over 60 Whig gatherings; was elected to the Massachusetts House of Representatives in the same year; and held a seat in the State Senate in 1842–1845; was reëlected to the Senate in 1850, and was its president for two years. In 1855 he was elected to the United States Senate. On May 22, 1856, Charles Summer, his colleague, was assaulted by Preston S. Brooks, and on the next day Senator Wilson pronounced the action "brutal, murderous, and cowardly." Soon afterward Brooks challenged Wilson to a duel, but the latter refused on the ground that duelling was both unlawful and barbarous. During his career in the Senate he was a fearless opponent of slavery. He was reëlected to the Senate; in 1861 became chairman of the Committee on Military Affairs. In this capacity, at the beginning of the Civil War he influenced Congress to pass an act permitting the recruiting of 500,000 men. He was a third time returned to the Senate, and there remained till elected Vice-President of the United States in 1872, on the ticket with General Grant. His notable addresses include "Defense of the Republican Party" (1856); "Are Workingmen Slaves?"; "The Death of Slavery is the Life of the Nation"; "The Republican and Democratic Parties" (1868); etc. He also was the author of "History of the Anti-Slavery Measures of the Thirty-seventh and Thirty-eighth United States Congresses" (1865); "Military Measures of the United States Congress" (1866); "Testimonies of American Statesmen and Jurists to the Truths of Christianity" (1867); "History of the Reconstruction Measures of the Thirty-ninth and Fortieth Congresses, 1865–1868" (1868); "History of the Rise and Fall of the Slave Power in America" (3 vols. 1872–1875); etc. He died in Washington, D. C., Nov. 22, 1875.

**Wilson, Henry Bristow,** an English clergyman and educator; born in London, in 1803; became professor of Anglo-Saxon at Oxford; was one of the seven authors of the famous volume of "Essays and Reviews" (1860); his contribution being "The National Church"; and wrote: "The Communion of Saints: An Attempt to Illustrate the Principles of Church Union" (1851), the Bampton lecture contributed to "Oxford Essays"; etc. He died in Lee, Kent, Aug 10, 1888.

**Wilson, Horace Hayman,** an English Orientalist; born in London, England, Sept. 26, 1786; was educated for the medical profession; went out to Bengal as assistant-surgeon in the service of the East India Company; was appointed to an office in the Calcutta mint, of which he afterward became assay-master and secretary; devoted his leisure to the study of Sanskrit; was elected (1832) Boden Professor of Sanskrit at Oxford University; and soon afterward

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became librarian at the India House and director of the Royal Asiatic Society. His writings included a "Sanskrit-English Dictionary" (1819), and numerous translations of Sanskrit poems, etc. He died in London, May 8, 1860.

**Wilson, James,** an American agriculturist; born in Ayrshire, Scotland, Aug. 16, 1835. He removed with his father to the United States in 1852, and in 1855 settled in Iowa. He served three terms in the Iowa Legislature, being speaker for two years. He was elected to the 43rd, 44th and 48th Congresses. In 1891 he was Professor of Agriculture in the Iowa Agricultural College. In 1897 he was appointed Secretary of the Department of Agriculture in the cabinet of President McKinley; was reappointed in 1901; and retained by Presidents Roosevelt and Taft.

**Wilson, James Grant,** an American author; born in New York city, April 28, 1832; served in the Civil War. Besides numerous addresses, essays, and articles in periodicals, he published: "Biographical Sketches of Illinois Officers" (1862–1863); "Love in Letters, Illustrated in the Correspondence of Eminent Persons" (1867); "Life of General Grant" (1868–1885); "Life of Fitz-Greene Halleck" (1869); "Sketches of Illustrious Soldiers" (1874); "Poets and Poetry of Scotland" (1876); "Centennial History of the Diocese of New York, 1775–1885" (1886); "Bryant and His Friends" (1886); "Commodore Isaac Hull and the Frigate Constitution" (1889); "Life of General Grant" (1897); "The President of the United States" (1901); etc. He was the editor (with John Fiske) of "Appleton's Cyclopædia of American Biography" (6 vols. 1886–1889), and alone, of "Memorial History of the City of New York."

**Wilson, James Harrison,** an American military officer; born in Shawneetown, Ill., Sept. 2, 1837; was graduated at the United States Military Academy in 1860 and assigned to the Department of Oregon in the topographical engineer service. During the Civil War he served with distinction as an engineer, notably at the Richmond raid and the operations near Petersburg. He commanded the 3d Division of Sheridan's cavalry in 1864; participated in the capture of Fort Pulaski and the campaigns of Antietam Vicksburg, Chattanooga, and the Wilderness; commanded in the assault and capture of Selma and Montgomery, Ala., Columbus and Macon, Ga., and took a leading part in the capture of Jefferson Davis. On July 28, 1866, he was brevetted Major-General, U. S. A., for gallant and meritorious services during the war, and on Dec. 31, 1870, was honorably discharged at his own request. After leaving the army he was engaged in large railroad and engineer-

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ing operations both in the United States and abroad and, on the outbreak of the American-Spanish War was appointed Major-General of volunteers and was assigned to the command of the 1st Division, 1st Army Corps, in the campaign in Porto Rico. His publications include "China, Travels and Investigations in the Middle Kingdom"; "Life of Andrew Alexander"; "Life of General Grant"; etc.

**Wilson, Jeremiah Morrow,** an American jurist; born in Warren co., O., Nov. 25, 1828; received an academic education; was judge of the Court of Common Pleas of Fayette co., Ind., in 1860–1865; judge of the Circuit Court in 1865–1871; member of Congress in 1871–1875; declined a renomination; resumed the practice of law in Washington, D. C. During his professional career in that city Judge Wilson was connected with numerous famous cases. Besides having acted as attorney for the Union Pacific Railroad and the Mormon Church, he was counsel for the plaintiff in the Breckinridge-Pollard breach of promise suit, defended the sugar witnesses who had refused to testify before a Senate committee; was counsel in the court-martial of General Swain, and was connected with the "Alabama Claims" and the French "Spoliation" cases; etc. In 1901, after the Navy Department had granted the request of Admiral Schley for a court of inquiry, the admiral chose Judge Wilson as his chief counsel. While serving as such Judge Wilson died suddenly in Washington, D. C., Sept. 24, 1901.

**Wilson, John,** pseudonym, CHRISTOPHER NORTH, a Scotch author; born in Paisley, Scotland, May 18, 1785; was educated at Glasgow University and at Magdalen College, Oxford; noted as a scholar and athlete; settled in Cumberland, and became one of the "Lake Group" with Wadsworth, De Quincey, Southey, and Coleridge. Losing most of his inherited fortune, he removed to Edinburgh and studied law. From the starting of "Blackwood's Magazine" in 1817 he was a chief contributor, and was for many years its generally accredited head. For it he wrote (with Maginn and others, but largely alone) the "Noctes Ambrosianæ," by which he is best remembered — imaginary dialogues at Ambrose's tavern in Edinburgh, between the leading contributors to the magazine; a selection from these was published in 1876. He also wrote, among other things: "The Isle of Palms" (1812), and "The City of the Plague" (1816), poems; "Lights and Shadows of Scottish Life" (1822); "The Trials of Margaret Lindsay" (1823); "The Foresters" (1825); and "Essay on the Genius and Character of Burns" (1841). He was Professor of Moral Philosophy at Edinburgh University from 1820 to near the end of his life. He died in Edinburgh, April 3, 1854.

**Wilson, John,** a Scotch missionary; born near Lauder, Scotland, Dec. 11, 1804; was educated at the University of Edinburgh, went out to Bombay in the service of the Scottish Missionary Society, and in 1843 transfered his labors to the mission work of the Free Church of Scotland. He established numerous schools; became vice-chancellor of the University of Bombay; contributed largely to the abolition of the practice of suttee; traveled all over India establishing missionary centers; and was universally honored and beloved by the natives. His linguistic ability was remarkable, and his contributions to literature included: "The Parsi Religion" (1842); "India Three Thousand Years Ago" (1857); "Memoirs on the Cave-Temples of India" (1859); "The Lands of the Bible Visited and Described" (1867); and "Indian Caste" (1877). He died in Edinburgh, Scotland, Dec. 1, 1875.

**Wilson, John Mackay,** a Scotch author; born in Tweedmouth, in 1804. He edited for several years the "Berwick Advertiser." He was the editor and principal author of "Tales of the Borders" (1835–1840; last ed., enlarged and revised, 24 vols. 1869), of which over 150,000 copies have been sold. He died in Berwick-on-Tweed, Oct. 2, 1835.

**Wilson, John M.,** an American military engineer; born in the District of Columbia, Oct. 8, 1837; was graduated at the United States Military Academy in 1860, and entered the artillery, but was transferred to the Ordnance Department the same year, to the artillery again in 1861, and to the Engineer Corps, in which he rendered his most conspicuous service, in 1863. He was promoted 2d and 1st lieutenant in 1861; captain in 1863; major in 1867; lieutenant-colonel in 1884; colonel in 1895; and Brigadier-General and chief of engineers Feb. 1, 1897; and was retired in October, 1901. He took part in the battles of Gaines's Mills and Malvern Hill; the capture of Spanish Fort in Mobile harbor and Fort Blakely; was ordnance officer at the arsenals at Fort Monroe and Washington, D. C.; planned the first defenses of the National Capital in 1861; served in the Manassas, Peninsular, and the Maryland campaigns; superintended the construction of the defenses at Harper's Ferry, Baltimore, Vicksburg, Natchez, Ship Island, Miss., and New Orleans; and was superintending engineer in the construction of Forts Ontario, Niagara, Stevens, and Canby. Besides these duties he had charge of the engineering work for the improvement of various harbors, rivers, and canals; and superintended the completion of the

Washington monument, and the construction of the Army Medical Museum and Library; etc. In 1897 he was presented with the Congressional medal of honor "for most distinguished gallantry in action," the occasion being in the battle of Malvern Hill when he was a 1st lieutenant of Artillery. On Jan. 14, 1902, President Roosevelt appointed him to represent the United States army at the coronation of King Edward VII.

**Wilson, Richard,** an English landscape painter; born in Penegoes, England, in 1714. After being a pupil for some years to a portrait painter in London, he went to Italy, where he met Zuccarrelli, who persuaded him to devote himself wholly to landscape. Having stayed some time at Rome and Naples he returned to England in 1755, and settled in the metropolis; but his paintings were treated with much indifference, and he himself lived in abject poverty till his appointment as librarian to the Royal Academy in 1776. He is now, however, regarded as one of the first of English landscape painters. Among his best works are the "Niobe," the "Ruins of the Villa of Mæcenas," "Phaethon," "Snowdown," the "View of Rome from the Villa Madama," etc. He died in Llanferras, England, in 1782.

**Wilson, Sir Robert Thomas,** an English military writer; born in London, England, in 1777. He served in the Peninsular war; was British military commissioner at the Russian and allied headquarters, 1812–1814; member of Parliament and governor of Gibraltar, 1842–1849. He wrote: "History of the British Expedition to Egypt" (1802); "Sketches of the Campaigns in Poland" (1810); "Military and Political Power of Russia" (1817); "Narrative of Events During the Invasion of Russia, 1812" (1860); "Dairy" (1861); etc. He died in London, May 9, 1849.

**Wilson, Theodore Delevan,** an American naval constructor; born in Brooklyn, N. Y., May 11, 1840; was an apprentice in the Brooklyn navy yard; entered the construction department of the navy in August, 1861, as a carpenter. On May 17, 1866, he was made an assistant naval constructor; and was appointed chief of the Bureau of Construction and Repair in 1882, 1886, and 1891. During his service he planned the battleship "Maine," the cruisers "Chicago," "Boston," and "San Francisco," and the gunboats "Concord," "Bennington," "Yorktown," and "Petrel." He also invented a bolt extractor, which is now generally used, and published "Shipbuilding, Theoretical and Practical." He died in the navy yard, Boston, Mass., June 29, 1896.

**Wilson, Thomas,** an English clergyman; born in Burton, England, Sept. 20, 1663; studied at Trinity College, Dublin, and served as curate of Newchurch Kenyon from 1686 till 1692, when he became chaplain to the Earl of Derby, who appointed him Bishop of Sodor and Man in November, 1697. For 58 years he governed his diocese with constant care. His "Principles and Duties of Christianity" (1707), commonly called the Manx Catechism — the first book printed in the native tongue — and his "Essay towards an Instruction for the Indians," written for Oglethorpe's Georgia plantation scheme, and submitted to Isaac Watts (published only in 1740), were combined to form "The Knowledge and Practice of Christianity made easy to the Meanest Capacities" (1775). But his name best survives in his admirable "Short and Plain Instructions for the Better Understanding of the Lord's Supper" (1736), and "Sacra privata, Private Meditations, Devotions and Prayers" (1800). Other books are "Parochialia, or Instructions for the Clergy" (1788), and "Maxims of Piety and Christianity" (1789). He instituted a Manx translation of the Bible, which was completed 1772–1775. He died March 7, 1755.

**Wilson, William,** an American poet; born in Perthshire, Scotland, Dec. 25, 1801; and in 1833 removed to the United States. He edited the "Scottish Songs, Ballads, and Poems" of Hew Ainslie (1855), and several other volumes. His "Poems," edited by Benson J. Lossing, appeared in 1870, revised and enlarged editions in 1875 and 1884. He died in Poughkeepsie, N. Y., Aug. 25, 1860.

**Wilson, Woodrow,** an American educator; born in Staunton, Pa., Dec. 28, 1856; was Professor of Jurisprudence and Politics in Princeton University in 1890-1902, and president in 1902-1910, when he resigned to accept the Democratic nomination for governor of New Jersey, and after a spirited campaign he was elected. His books are: "Congressional Government: A Study of American Politics" (1885); "The State: Elements of Historical and Practical Politics" (1889); "Division and Reunion," in "Epochs of American History" (1893); "An Old Master, and Other Political Essays" (1894); "Colonies and Nation" (1900); "A Short History of the People of the United States" (1901); etc.

**Wilson College,** an educational institution for women in Chambersburg, Pa.; founded in 1870 under the auspices of the Presbyterian Church; has an endowment exceeding $60,000; grounds and buildings valued at over $270,000; volumes in the library, about 7,000; average number of faculty, 35; average student attendance, 350.

**Wilsonite,** a massive mineral yielding square prisms by cleavage; hardness, 3.5;

sp. gr. 2.76–2.78; luster, vitreous to pearly; color, reddish-white to rose or peach blossom red. Analyses indicate that it is an altered scapolite. Occurs at Bathurst, Canada; and in Northern New York.

**Wilton Carpet,** a carpet made like Brussels, excepting that the wire is flattened instead of being round, and has a groove along the upper surface, which acts as a director for the knife by which the loops are cut and the wire liberated. So called from the place of its manufacture.

**Wimbledon,** a municipal borough (created in 1905) and residential district in Surrey, England; 7 miles S. W. of London. Here from 1860 till 1889 in July was held the annual meeting of the National Rifle Association, since transferred to Bisley near Woking. Linnæus here first saw the gorse in bloom; here many duels were fought; and here is an earthwork popularly ascribed to Cæsar. Pop. (1901) 41,652.

**Wimodausis** (a composite name formed from the words, wife, mother, daughter, and sister), a secret society composed exclusively of the wives, mothers, unmarried daughters and unmarried sisters of Master Masons. It originated in Pittsburg, Pa., in 1895. The object of the society is: "To promote friendship and a kindly interest in the welfare of the members, and to stimulate intellectual activity by an interchange of thought on all subjects which will tend to the mutual advancement of the wives, mothers, daughters, and sisters of Master Masons."

**Wimple,** or **Wimpel,** a covering of silk or linen for the neck, chin, and sides of the face, worn usually out of doors. It was often bound on the forehead by a fillet of gold, plain or set with jewels, or by a band of silk. It is still retained as a conventual dress for nuns.

**Winandermere.** See WINDERMERE.

**Winans, Ross,** an American inventor; born in Vernon, N. J., in October, 1796; went to England to examine English railroad systems in the interest of the Baltimore and Ohio railroad; and after his return built the first locomotive used on that railroad. He also invented the camel-back locomotive and the eight-wheeled car, and established in Baltimore the largest machine shops in the United States. In 1861 he was elected to the extra session of the Maryland Legislature, but was imprisoned in Fort McHenry. He died in Baltimore, Md., April 11, 1877.

**Winans, Thomas DeKay,** an American engineer; born in Vernon, N. J., Dec. 6, 1820; son of Ross; was made a partner with his father and his brother, William Lewis. In 1843 the Russian government invited his father, with Andrew M. Eastwick, and Joseph Harrison, to undertake a contract to build a railroad from St. Petersburg to Moscow. He took his father's place and with the others mentioned executed the contract at a cost of $3,000,000. Subsequently other contracts were made in Russia which were very lucrative. He designed with his father and brother a tubular arrangement for the feeding of young trout, and a system of steam navigation known as the cigar-ship. He died in Newport, R. I., June 11, 1878.

**Wince,** in dyeing, a reel placed over the division wall between two pits, so as to draw the cloth from either, discharging it into the other, according as the handle is turned. The wincing machine is a succession of winces over which the cloth passes continuously over reels dipping into tanks placed in succession, and holding a mordant, a dye, soap-suds, solution of bleaching powder, a chemical solution of any kind, or water. The tanks are called wince pits or wince pots.

**Wincey,** a strong and durable cloth, plain, or twilled, composed of a cotton warp and a woolen weft. It is much worn by women as skirtings and petticoats, and a lighter class is used for men's shirts.

**Winch,** the crank, projecting handle, or lever by which the axis of a revolving machine is turned, as in the windlass, grindstone. The most simple form of hoisting machine, consisting of a roller on which the rope is wound, the turning power being a crank. It has many modifications in respect of its adaptation to cranes and derricks. Increased power is obtained by placing a large spur-wheel on the roller shaft and turning it by a pinion on the crank shaft. When on a movable frame, with drum and gearing, and adapted for hauling in the fall of the hoisting tackle of derricks, etc., it is called a crab.

**Winchell, Alexander,** an American geologist; born in Dutchess co., N. Y., Dec. 31, 1824. He lectured extensively and contributed to many journals. His writings include: "Sketches of Creation" (1870); "Geological Chart" (1870); "The Doctrine of Evolution" (1874); "Science and Religion" (1877); "Preadamites" (1880); "Sparks from a Geologist's Hammer" (1881); "World and Life" (1883); "Geological Studies" (1886); and "Walks and Talks in the Geological Field" (1886). He died in Ann Arbor, Mich., Feb. 19, 1891.

**Winchester,** a famous city of Hampshire, England, on the Itchen. The Castle Hill is the site of the old castle, or royal palace, built in the 13th century by Henry III., and of a magnificent hall, of which the only remaining portion is used as the county court. The cathedral is a beautiful and imposing pile. The college of Winchester was founded by William of Wykeham, Bishop of Winchester, in 1387. The industries

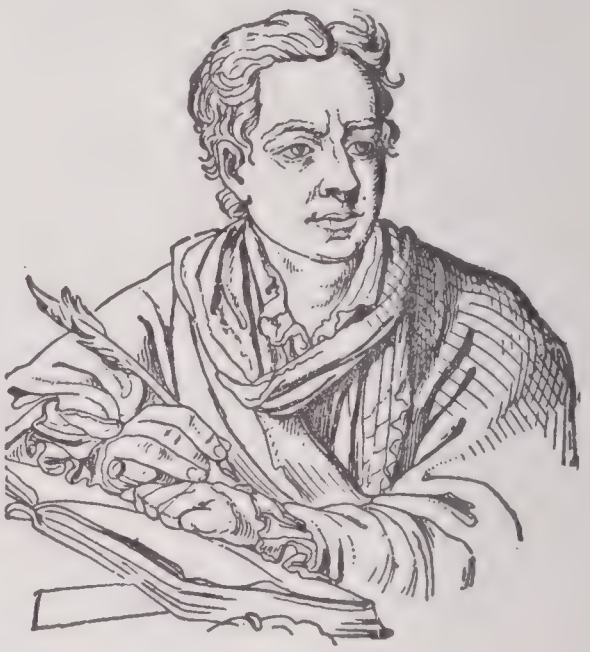
of Winchester are unimportant. Winchester, the Roman Venta Belgarum, was the site of a British city before the arrival of the Romans in Britain, Caer-Gwend. It afterward became a Roman station, and as such was a place of considerable importance, and contained temples of Apollo and Concord. Pop. (1901) 20,929.

**Winchester,** a town and county-seat of Clark co., Ky.; on the Louisville and Nashville, the Chesapeake and Ohio, and other railroads; 18 miles E. of Lexington. It is in the celebrated "Blue Grass" region. Here are the Kentucky Wesleyan College, Winchester Female College, the Cooper Female Institute, street railroad and electric light plants, waterworks, National and State banks, and several newspapers. The principal industries are agriculture and stock raising. Pop. (1890) 4,861; (1900) 5,964; (1910) 7,156.

**Winchester,** a city and county-seat of Frederick co., Va.; on the Cumberland Valley and the Baltimore and Ohio railroads; 88 miles W. by N. of Washington, D. C. It is in a beautiful and fertile country, which is part of the great Shenandoah valley of Virginia. The houses are built in a compact and substantial manner, mostly of brick and stone. Here are numerous churches, National and other banks, Fairfax Hall for Girls, the Valley Female College, the Shenandoah Valley Academy, and several weekly newspapers. The city has glove factories, paper mill, flour mills, broom factory, foundries, and cigar factories, and an assessed property valuation of about $1,700,000. The city is the key to the Shenandoah valley. During the Civil War it was many times taken and retaken by the opposing armies, and several battles were fought near it. Pop. (1890) 5,196; (1900) 5,161; (1910) 5,864.

**Winchester, Battle of,** the name of several engagements in the American Civil War. The most important were: (1) A battle fought at Kernstown, Va., near Winchester, March 23, 1862, between the Federals under General Shields and the Confederates under General Jackson, in which the former were victorious. This battle is sometimes called the battle of Kernstown. (2) A victory gained by the Confederates under General Early, over the Federals under General Crook, July 24, 1864. (3) A battle fought by the Federals under General Sheridan and the Confederates under General Early, at Winchester, Va., Sept. 19, 1864. The latter were defeated, with a loss of 5,000 men.

**Winckelmann, Johann Joachim,** a German archæologist, the founder of scientific archæology and of classic art history; born in Stendal, Germany, Dec. 9, 1717. He was the first to consider the masterpieces of classical antiquity as representative of a stage in the development of taste, and to formulate the theory of evolution in art. He seems to have obtained his first clue from some observation of Velleius Paterculus and Quintilian. His greatest work is a "History of the Art of Antiquity" (1764), afterward supplemented by "Ob-



JOHANN J. WINCKELMANN.

servations on the History of Art" (1767). He also published: "Thoughts on the Imitation of Greek Works in Painting and Sculpture" (1755); "Architecture of the Ancients" (1762); "Unknown Memorials [or Monuments] of Antiquity" (1767); and many essays and pamphlets. He died in Trieste, June 8, 1768.

**Wind,** air in motion; the distributer of heat and moisture over the earth's surface; thus constituting a principal factor of what is called the weather. Any cause which disturbs the equilibrium of pressure of the atmosphere will give rise to aërial currents. The most potent causes are variations in temperature and in amount of aqueous vapor. Winds will always blow, or tend to blow, from the regions of higher to regions of lower pressure, and the greater this difference, or, as the meteorologist expresses it, the steeper the gradient, the greater will be their force or intensity. The study of the action of the wind thus takes into account the differential pressure producing it, its direction, and its velocity; and for the sake of convenience of record and discussion winds are classified according to their character as permanent, periodical, and variable; with respect to direction, we distinguish between horizontal, vertical, inclined, and spiral movements. Various scales are in use; the seaman is generally satisfied with eight divisions, viz., the directions of the cardinal points and the four intermediate points. On land, when greater precision can be had, as many as 32 equi-

Wind

distant compass directions may be employed, but in more refined discussions the ordinary division of the circle into degrees has been used. With respect to velocity, the scales adopted in different countries, and used on land or sea, vary likewise according to the degree of precision desired.

The following scale distinguishes 10 grades favored by the United States Weather Bureau. The relations between velocity expressed in miles per hour and the pressure expressed in pounds per square foot are clearly shown, as well as the ordinary designation of the strength of the wind attaching to each grade:

| GRADE | Velocity in miles per hour. | Pressure in pounds per sq. ft. | Designation. |
|---|---|---|---|
| 1.. | 2 | .02 | Very light breeze. |
| 2... | 4 | .08 | Gentle breeze. |
| 3... | 12 | .75 | Fresh wind. |
| 4... | 25 | 3.00 | Strong wind. |
| 5... | 35 | 6.00 | High wind. |
| 6... | 45 | 10.00 | Gale. |
| 7... | 60 | 18.00 | Strong gale. |
| 8... | 75 | ..... | Hurricane. |
| 9... | 90 | ..... | Violent gale. |
| 10... | 100 and over. | ..... | Violent tempest. |

Storm warnings, as dangerous to navigation, are given when the wind velocity reaches or surpasses 35 miles an hour (see WIND SIGNALS.) During cyclonic storms or tornadoes the velocity is often very much greater, and may approach the upper limit of our scale. Generally the greater the elevation of a place above the sea-level the greater the velocity of the wind, and winds blow stronger at sea than over land.

The general circulation of the atmosphere is a consequence of the variation in the solar heat radiated to different parts of this gaseous envelope, and diffused through it, but modified by the rotation of the earth and its revolution around the sun, as well as by the irregular distribution of land and water over the globe. It may be understood by considering that all winds originate in changes of either temperature or humidity, subverting the equilibrium of pressure between adjacent regions. Thus, if over one place the air gets heated it becomes specifically lighter, ascends, and thereby produces, near the surface, an inflow of colder air from adjacent places to take its place. Again, suppose the air over one region to become more highly charged with vapor than that of a surrounding place, the moister air being lighter will ascend, while the heavier and drier air will flow in below. In connection with this it may be remarked that the equilibrium of air resting on dry land, and exposed to direct solar heat, is more easily disturbed, in consequence of the high temperature acquired by the land, than that of air over a water surface under the same exposure. In the latter case the heat received is absorbed and diffused by agitation through a medium of great capacity for heat; also, during the absence of the sun, land will cool quicker than water, and become much colder than the latter.

That portion of the atmosphere which is incumbent over the equatorial regions of the globe, being under a vertical sun and subject to greater solar action, is in consequence dilated, and, ascending, will overflow, as an upper current, the adjacent zones of higher N. and S. latitudes, thus creating surface currents which flow from the higher latitudes toward the equator, in order to restore the equilibrium. Were the earth at rest, then directions would be N. and S., but in virtue of its rotation which at the equator carries a point from W. to E. over about 17 miles a minute, directions are deflected toward the right in the Northern Hemisphere and toward the left in the Southern. As we recede from the equator the surface velocity continually diminishes, reaching zero at the poles. Winds, therefore, blowing along the earth's surface toward the equator are constantly arriving at places of greater velocity than those just left, and the wind will appear to lag behind and acquire an E. tendency or become N. E. in the Northern and S. E. winds in the Southern Hemisphere. These winds are known as the trade winds. They are separated by a belt of calms from 4° to 8° wide, which, over the Atlantic Ocean, lies N. of the equator. Here the N. trades prevail between lat. 7° and 30° N., and the S. trades between lat. 3° N. and 25° S. These limits follow the sun in its annual course, being farthest to the S. during the northern winter, and farthest to the N. during summer, lagging in the extreme phases of motion about one month behind the solstices.

The tract of low pressure, or the region of the calms, likewise varies with the position of the sun, the maximum N. limit being 11° N. in August, and the most S. in lat. 1° N. in February. Over this belt the rainfall is frequent and heavy. In the Pacific Ocean the N. E. trades extend from about lat 2° to 23° N., and the S. E. from about lat. 3° to 21° S., with a belt of calms about 5° in width. In the middle latitudes, or the temperate zones of both hemispheres, from about the 30th to 50th parallels, where the upper currents have again descended to the surface, we encounter the permanent W. winds, which have also been called the anti-trades. A knowledge of the distribution of the trades and anti-trades is of the utmost importance to the navigator, who is now furnished with charts showing what winds (their relative frequency from each quarter) he may expect to find in every month of the year, and for certain subdivisions of the oceans. While the general circulation is as briefly outlined above, the winds are greatly subject to local influences, and to follow out the laws of the prevailing

winds over all parts of the globe, and throughout the seasons, lies necessarily beyond the scope of this article.

Of the periodical winds, blowing half a year in one, and the other half in the other direction, the monsoons are the most noteworthy, in particular those of Southern Asia, where from October to April the N. W. and from April to October the S. W. winds are blowing with great steadiness. Their reversal in May and October is often accompanied by violent hurricanes and deluges of rain. Monsoons are the direct consequence of the unequal effect of the sun's heating power over large tracts of land, in contrast with its effects over a large expanse of ocean. On a smaller scale sea and land breezes have a similar origin; on S. shores the land becomes powerfully heated in the day time, while at night its temperature sinks below that of the adjacent ocean. This circumstance gives rise in the morning to the welcome sea breeze, setting in toward land, at first gently, but reaching a stiff breeze at the time of the greatest heat of the day, or about 2 P. M. After this hour it sinks gradually to a calm in the evening, to be followed by the contrary or land breeze, blowing strongly from the land seaward during the night, again dying away in the early morning.

Tornadoes also have their seasons of frequency, occurring in the United States most frequently in May, April, June, and July, in the order named; while the hours of greatest frequency are between half-past three, and five o'clock in the afternoon —*i. e.*, soon after the warmest part of the day, when the warm ascending currents are most likely to meet the cooler descending current to the meeting of which currents the violence of the tornado is, in a great measure, due. We must also notice a remarkable law, known as Dove's or Buys Ballot's, from its importance to the navigator, as its knowledge will enable him to avoid the most destructive part of revolving storms. It has been noted that in the Northern Hemisphere the wind has a decided tendency to to veer round the compass according to the sun's motion, *i. e.*, to pass in the direction (say) from N. though N. E., E., S. E., etc., round to N., and that a revolution in the opposite direction is very rare. Ballot's law may be stated as follow: (1) Stand with your back to the wind, and the center of depression or of lowest barometer will be to your left in the Northern Hemisphere and to your right in the Southern Hemisphere; (2) stand with the high barometric pressure to your right and the low pressure to your left, and the wind will blow on your back, the position to be reversed for the Southern Hemisphere. In general, the resultant wind can be worked out from a knowledge of the isobaric curves, or graduated lines of equal pressure corresponding to the time and place. In cyclones, then, the rotation of the air in the Northern Hemisphere is in a direction contrary to the hands of a watch laid face uppermost, and in the same direction as the hands for the opposite hemisphere. At the equator violent cyclones do not occur. It is well known that at the time the center of a cyclonic depression passes over a place there is a calm or lull in the wind, which lull is preceded and followed by winds of equal violence, but in opposite directions. Anemometers, or instruments which measure the force and direction of the wind, are of two kinds: those which record at stated intervals, and those which give an automatic and continuous registration. Some are self-registering instruments for the direction, others for the pressure of the wind. Of velocity anemometers that of Robinson has a high reputation. It registers the velocity by the revolutions of a vertical shaft connected with arms and hemispherical cups, on which the wind impinges. It thus registers the number of miles passed over by the wind in a given time. See ANEMOMETER: CYCLONE: TORNADO: WEATHER BUREAU: WIND SIGNALS.

**Windage,** in ordnance, the difference between the bore of a gun and the diameter of the projectile, varying from .15 to .9 of an inch for spherical projectiles. For rifled guns the windage is much smaller.

**Windau,** a seaport of Russia, province of Kurland; at the mouth of the Windau river; in the Baltic, on a deep harbor inaccessible to large ships through a sandbar. It has a Lutheran church, a Russian church, a Catholic chapel, and a synagogue.

**Wind Chest,** an air-tight box in an organ or other wind instrument played by keys, into which the air is received from the wind trunk, and from which air is admitted by valve ways through the channels of the sound board, to the air ducts communicating with the respective pipes.

**Wind Contusion,** a name formerly applied to any internal injury produced by a shot or bullet without any external mark of violence, the injury itself being erroneously attributed to what was called "the wind of the ball," *i. e.*, air violently displaced by the velocity of a projectile. It is now known that such injuries are produced either by spent balls or by projectiles striking the body at an oblique angle, when the skin does not always give way, though deep-seated structures, such as the muscles, or large organs, as the liver, may be completely ruptured or crushed.

**Wind Cutter,** in an organ-pipe, the lip or edge against which the issuing sheet of air impinges. The vibration thereby im-

parted is communicated to the column of air in the pipe, producing a musical note whose pitch is determined by the length of the pipe, the quality of the tone by the size of the pipe and the material of which it is made, etc.

**Wind Flower,** in botany: (1) The genus *Anemone.* (2) *Gentiana pneumonanthe.* It has an upright stem four to six or eight inches high, and terminal or axillary flowers deep blue, with five broad greenish lines. It grows in moist, heathy places in several parts of England. Called also marsh gentian.

**Wind God,** a deity presiding over the wind. This might be one of the principal gods, as Æolus, of classic mythology, with minor deities subject to him; or one of the minor deities, as among the North American Indians of the present day.

**Windermere,** or **Winandermere,** the largest lake in England, called from its beauty "Queen of the Lakes"; partly in the county of Lancaster, and partly divides that county from Westmorland. It is nearly 11 miles long and about 1 mile in extreme breadth; fed by the Brathay and the Rothay, the waters of which become united before entering the lake, and by the streams which drain the neighboring lakelets of Esthwaite, Troutbeck, and Blelham; and, lying 134 feet above sea-level, discharges its surplus waters S. into Morecambe Bay by the Leven. Next to Wast Water, Windermere is the deepest of all the English lakes, its greatest depth being 240 feet, while Wast Water is 270 feet deep. It contains a number of islands, the largest being 28 acres in area Soft rich beauty is the principal characteristic of the islands of the lake, of the wooded shores, and of the scenery around; there being a total absence of that wildness and sublimity which characterize some of the other lakes, except at the N. end, where Langdale Pikes, Harrison Stickle, Sca Fell, and Bow Fell stand forward prominently in the landscape.

**Windham, William,** an English statesman; born in London, May 3, 1750; was educated at Eton, at Glasgow University, and University College, Oxford. In 1784 he was returned to Parliament for Norwich. In 1783, on the formation of the Portland ministry, remarkable for the coalition of Lord North and Mr. Fox, he had become principal secretary to Lord Northington, then lord-lieutenant of Ireland, but ill-health soon obliged him to resign. He followed Burke in his view of the French Revolution, and in 1794 he became secretary-at-war under Pitt. He went out with Pitt in 1801, and denounced Addington's peace of Amiens (1801) in a speech of splendid eloquence. This lost him his seat for Norwich, but he was elected for St. Mawes in Cornwall, and on the return of the Grenville party to power (January, 1806) he became war and colonial secretary. He helped Cobbett to start his "Political Register" (January, 1802), carried a scheme for limited service in the army (1806), and at the general election in October, 1806, found a seat in New Romney, and next year at Higham Ferrers. He went out of office in 1807, when the Portland administration was formed, having previously declined the offer of a peerage, and strongly denounced the expedition against Copenhagen, and afterward the disastrous Walcheren expedition. In 1808 a clause was introduced by his successor, Lord Castlereagh, into the Mutiny Act, permitting men to enlist for life, contrary to Windham's scheme of limited service, which was, however, readopted in 1847. He died June 4, 1810.

**Wind Instruments,** musical instruments the sounds of which are produced by the action of the breath of a player or of a pair of bellows on a column of air. The organ is really a collection of wind instruments of different kinds, forming a species of orchestra. Ordinary wind instruments are constructed of wood, such as the flute, piccolo, clarionet, basset horn, oboe, and bassoon; or of metal, such as the horn, trumpet, serpent, cornet-a-piston, ophicleide, saxhorn, and bombardon. Those of wood have a soft tone, those of brass a loud and powerful tone. Wind instruments were used sparingly in the early days of the orchestra, but with great liberality in Handel's time, when for every three stringed instruments two wind instruments were used. The proportion at present is greatly less. By additional finger keys, etc., wind instruments have been greatly improved in the last century. The bagpipe is a wind instrument of a very primitive type, with a leather case as a wind chest attached to three pipes.

**Windlass,** a mechanical contrivance used on board ship for raising anchors and other heavy masses. The principle of its action is the same as that of the capstan, from which it differs mainly in the horizontality of its axis. It consists essentially of a large roller, supported in checks or windlass bitts, and rotated by handspikes fitting into mortices in the windlass, or by means of a single handle with or without additional wheelwork. To prevent the windlass from slipping back under the severe pull of the chain, a strong ratchet wheel is fixed on the roller, and into its teeth a number of pawls pivoted in an upright post called the pawl bitt fall as the windlass rotates, so as to sustain the stress as the spikes are being shifted for a new purchase.

**Windmill,** a mill which receives its motion by the wind acting on sails, and which is used for grinding grain, raising or pumping water, and other purposes. When wind is employed as the first mover of machinery, it may be applied in two ways: (1) By receiving it on sails which are nearly vertical, and which give motion to an axis nearly horizontal, in which case the machine is called a vertical windmill; or (2) by receiving it on vertical sails which move in a horizontal plane, and give motion to a vertical axis, in which case it is called a horizontal windmill. Sometimes the whole mill is made to turn on a strong vertical post, and is then called a post mill; but more commonly the roof or head only revolves, carrying with it the wind wheel and its shaft, this weight being supported on friction rollers.

As it is necessary that the extremity of the wind shaft must always be placed so as to point to the quarter from which the wind blows, a large vane or weathercock is placed on the side which is opposite the sails, thus turning them always to the wind. But in large mills the motion is regulated by a small supplementary wind wheel, a pair of sails occupying the place of the vane, and situated at right angles to the principal wind wheel. When the windmill is in its proper position with the shaft parallel to the wind, these supplementary sails do not turn; but when the wind changes they are immediately brought into action, and, by turning a series of wheel work, they gradually bring round the head to its proper position. On account of the inconstant nature of the motion of the wind, it is necessary to make some provision for accommodating the resistance of the sails to the degree of violence with which the wind blows. This is done by clothing and unclothing the sails; that is, by covering with canvas or thin boards a greater or smaller portion of the frame of the sails according to the force of the wind.

**Windom, William,** an American financier; born in Belmont, O., May 10, 1827; began practising law in Mount Vernon, O., in 1850. In 1852 he was made prosecuting attorney of Knox county, O. He held this position for three years, when he removed to Minnesota. He was sent to Congress from that State in 1859, and was reëlected to serve four successive terms, a period of 10 years, ending his career in the House in 1869. He was appointed to the United States Senate in 1870 to fill the unexpired term of Daniel S. Norton, deceased. He was also elected for the terms ending in 1878 and 1883. He resigned, however, in 1881 to accept the Treasury portfolio in President Garfield's cabinet, and on his retirement from the cabinet after that President's death he returned to the Senate, where he served the remainder of his term. He became Secretary of the Treasury in President Harrison's cabinet in 1889, and died in New York city, Jan 29, 1891.

**Window,** an aperture in the wall of a building for the admission of light and air. Modern domestic windows are usually rectangular openings occupied by movable frames filled with glass. The glazed portion or sash is hung or hinged in a frame, the horizontal stone forming the top of the window is the lintel, that at the bottom the sill, the sides of the opening are the jambs, and the portion between the outer face of the wall and the frame is the reveal. Architraves and other moldings commonly appear on the exterior. Venetian windows are large openings divided by piers or columns into three lights, sometimes arched. Windows projecting in a polygonal or semicircular form from the wall are termed bay or oriel windows; they were first introduced in Perpendicular style.

NORMAN WINDOW.

The architecture of the Egyptians and Greeks was practically windowless, light and air having been admitted by openings in the roofs. Small openings in the walls of Roman houses were not uncommon. They were at first closed by shutters or covered with a kind of lattice or trellis work; and afterward a transparent stone, called *lapis specularis,* the modern mica, brought from Spain and Cappadocia, was employed. Excavations at Pompeii have shown that glass windows were also used in the early days of the empire. The traceried windows peculiar to Gothic architecture was developed from the most simple forms. In Old English and Early Norman buildings the windows are small and arched; the interior, and sometimes the exterior, being widely splayed. Some Norman windows have two lights set in a shallow recess and surmounted by a single arched dripstone, and moldings are frequently introduced. Early English windows are for the most part long and narrow, with acutely-pointed heads. They occur singly, or in groups of two, three, five or seven lights under an acute arch.

Piercing the tympanum space above the lights with a trefoil, or other geometrical

figure, was the first step toward the development of the elegant and elaborate tracery which, with beautifully molded mullions, became universal in the Decorated style. Windows of the Perpendicular style are marked by a departure from graceful flowing tracery and the introduction of vertical members. Horizontal bars or transoms are likewise freely introduced, and flat instead of arched heads are gradually adopted till the window becomes divided into a series of plain rectangular lights. Circular or rose windows with dividing shafts or mullions radiating from the center are met with in Late Norman architecture, and many examples — for instance, in Lincoln Cathedral — remain to show the magnificence attained in their construction during the Early English and Decorated periods. See GLASS.

**Window Jack,** a scaffold for carpenters, painters, or cleaners, enabling them to reach the outside of the window. The frame has pivoted brace bars to rest against the outside of the house, and holdfasts hinged to an adjustable block; these rest against the inside of the window frame.

**Window Tax,** or **Window Duty,** a tax formerly imposed in Great Britain on all windows in houses (latterly above six in number). It was abolished in 1851, a tax on houses above a certain rental being substituted.

**Wind Rose,** in ordinary language, a card or table, with lines corresponding to the points of the compass, showing the connection of the wind with the barometer, etc. In botany, the *Papaver argemone*, a British poppy with small flowers, having narrow scarlet petals and a clavate capsule, hispid, with erect bristles.

**Windrow,** a row or line of hay raked together for the purpose of being rolled into cocks or heaps; also sheaves of corn set up in a row one against another, in order that the wind may blow between them. Also the green border of a field dug up in order to carry the earth on other land to mend it. Also a row of peats set up for drying, or a row of pieces of turf, sod, or sward, cut in paring and burning.

**Wind Sail,** in navigation, a canvas tube used as a wind conductor, having its open mouth presented toward the wind, or in the direction of motion, as on board a steamship, where it is used to direct a current of air down into the engine room to moderate the intense heat and improve the draught of the fires. The wind sail is used quite commonly on ships to ventilate and cool the cabins and "'tween decks," especially on board vessels in tropical climates.

**Wind-shake,** or **Wind-shock,** in *Anemosis,* a condition of timber which has caused it to part asunder at the circular lines of junction connecting the several zones of wood.

**Windsor,** a city of Ontario, Canada, in Essex co., on the Canadian shore of Detroit river, directly opposite the city of Detroit, and on the Grand Trunk, Canadian Pacific, Michigan Central, Wabash, and Père Marquette railways and their respective railway transfer steamboat lines, which transport the trains across the river, here half a mile wide. The leading business streets are Sandwich, Omelette, and Church streets, and Victoria and Bruce avenues, and the principal residential streets are Gayeau, Janette avenue, Pitt, London, and Wyandotte streets. Many Detroit citizens have their suburban homes here. The most noteworthy buildings are the opera house, Hôtel Dieu Hospital, city hall, St. Mary's Academy, the Methodist and Presbyterian churches, and Carnegie Library. There are one daily and four weekly newspapers. The educational and charitable institutions, besides those already mentioned, include Assumption College, Collegiate Institute, public and Roman Catholic separate schools, and Home of the Friendless. The surrounding agricultural district is one of the most highly cultivated in Canada, and produces large quantities of peaches, pears, grapes, etc. Rock salt is found in the vicinity. The industrial establishments include breweries, chemical works, salt works, and manufactories of sashes and doors, wire fencing, typesetting machines, tobacco, furniture, and other articles. The output of manufactured goods in 1906, according to the Dominion census, amounted in value to $1,715,160, against $1,260,947 in 1901. The water works and street electric lighting plants are owned and operated by the municipality. The assessed value of taxable property in 1906 was $8,037,950; municipal liabilities, $983,307; municipal assets, $1,076,119. Pop. (1901) 12,153; est. (1906) 14,802.

**Windsor,** properly called NEW WINDSOR, a parliamentary borough of Berkshire, England, on the Thames. Windsor and Eton in reality form one town, which is chiefly interesting on account of the antiquity of its castle and park, which have been a favorite residence of English monarchs, especially since the time of William the Conqueror. The older palace of the English kings was the Old Windsor, about 2 miles distant. The buildings may be said to be grouped in three portions: the Middle Ward, containing the Round Tower; the Lower Ward, on the W., containing St. George's Chapel, the houses of the Military Knights, cloisters, etc., and the Upper Ward, on the E., containing the sovereign's private apartments. The unfinished chapel, which was begun by Henry III., was completed by Edward III., rebuilt by Henry VII., and added to by Cardinal Wolsey. Under this chapel is the burial vault of the present royal family.

The park and forest immediately adjoining are 13,000 acres in extent. Pop. 14,130.

**Windsor Knight,** one of a body of military pensioners having their residence within the precincts of Windsor Castle. They are now called Military Knights of Windsor, and sometimes Poor Knights of Windsor.

**Windward, The,** the vessel in which Lieutenant Peary sailed from New York city, July 2, 1898, on his fifth expedition in search of the North Pole. The "Windward" had become famous as an Arctic sailer, having entered the polar ice every season since 1860, at which date she was built at Peterhead. She was originally a sailing vessel, but was fitted up with steam in 1866. She was for many years used as a whaler and went yearly to Greenland from 1860 to 1875, and on three successive years from 1865 she made a second trip to Davis Straits. The Jackson-Harmsworth polar expedition went in this vessel and afterward brought Nansen's party home. To the "Windward" belongs the honor of having proved the navigability of the Franz-Josef Land seas. She is constructed entirely of oak, doubled and tripled with African oak, and latterly has been greatly strengthened to resist enormous ice-pressure. During her service as a whaler she brought from the Arctic regions the produce of 22 black whales; 190 white whales, 218 bottlenose whales, and 71,866 seals.

**Windward Islands,** a group in the West Indies, comprising St. Lucia (the largest), St. Vincent, Barbadoes, Grenada, and Tobago.

**Wine,** a spirituous liquor produced by fermentation from vegetable substances containing saccharine matter. There are a great many vegetable substances from which, by this process, wine may be produced, such as apples, pears, currants, elderberries, and others; but unless otherwise expressed, the term is always used to indicate the fermented juice of the fruit of the common vine.

The history of the vine and its product goes back to the very earliest times of which there is any record, and it may almost be said that its use is coeval with the existence of man. In a very early part of the Mosaic record it is said, "Noah began to be a husbandman, and he planted a vineyard, and he drank of the wine, and was drunken" (Gen. ix: 20); and throughout the whole of the Old Testament narrative, and in the prophetical books, there are frequent references to the use of wine and its effects. In mythological times Bacchus or Dionysos, the son of Zeus and Semele, is known as the god of wine; and the early Greek poets have sung its praises. Homer speaks of wine in its 11th year; Horace commends wine which was of equal age with himself; and Pliny, who devotes to the subject an entire book of his work on natural history, mentions some which he had tasted which was 200 years old. In more modern times the culture of the vine has been a matter of careful study and anxious observation, and so important has become everything connected with its proper growth and propagation and the most advantageous use of its fruit that the published works on the subject are said to number no fewer than 600.

In wine producing countries the cultivation of the vine is as much a branch of national industry as that of wheat or other food producers is in others. The soils which are found to be suitable for its growth are very various in quality, but it thrives best along the borders of rivers or in places where a constant supply of water can easily reach its roots, as along the Rhine valley or in the paludial districts of the Gironde. It is usually propagated, not by seed, which takes five or six years before a seedling begins to bear, but by means of eyes cut from vines and planted in open beds and vineyards, or by planting cut canes which have been obtained from plants of the previous year, and which are usually not interfered with for three years after being put in the ground. The plants are placed in parallel lines, about a yard apart from each other, while the single vines are removed from each other by about the same interval.

When the grapes are ripe they are collected and transformed into wine with no unnecessary delay. White grapes are crushed and pressed, and the juice, freed from stalks and husks, is put into clean barrels and allowed to ferment in a cellar or other temperate place. Black grapes, which are to yield red wine are crushed, put into vats, juice, husks, and all, and allowed to ferment till the wine is completed, and has extracted the coloring matter. The wine is then drawn off, the murk pressed, and the united products put into barrels. The process of fermentation, on which the peculiar property of the extracted liquor depends, proceeds spontaneously after the grapes have been crushed and the liquor extracted, and its action is to convert the sugar contained in the fruit into alcohol and carbonic acid. Effervescent wines, such as champagne, are bottled, before the fermentation is quite complete, and in that way a portion of the carbonic acid which would otherwise have escaped is forcibly retained and dissolved in the wine. The amount of alcohol contained in the wine varies in different sorts. In the stronger ports and sherries it amounts to from 16 to 25 per cent.; in hock, claret, and other light wines from 7 per cent. The greater part of the wines having more than 13 per cent. of al-

Wine

cohol (*i. e.*, 26 degrees of proof spirit) may be assumed to be brandied or fortified with spirit.

The obscure process of fermentation, by which the sugar of grape juice is changed into alcohol, has been the subject of a vast amount of investigation by many eminent investigators, the last and greatest of whom is Pasteur, who published a most valuable work, "Studies of the Vine" (2d ed. 1873). The change is induced by a minute fungoid organism, *Mycoderma vini*, and chemically it consists in transforming 105.4 parts of grape sugar (glucose) into alcohol 51.1 parts, carbonic acid 49.4, succinic acid 0.7, glycerine 3.2, and yeast matter 1.0. With these there are also developed minute portions of fusel oil and ether, to which is due the aroma or bouquet of the wine. These ethers develop and interact while the wine is maturing, and as the value of a wine is entirely due to its richness in respect of these, the maturing and proper preservation of wine is a matter of the utmost importance. Other changes also occur during ripening. The acid tartrate of potash contained in the juice separates and forms a crust of argol; and frequently, especially with light wines, acid fermentation ensues, and the wine becomes sour. The acid fermentation is caused by a fungus, *Mycoderma aceti*, or by oxidation of alcohol by exposure. Other diseases of wine are due to parasitic and other growths, which have been traced by Pasteur.

The varieties of wine produced are almost endless, and differ in every constituent according to the locality, season, and age; but generally the produce of each vineyard retains its own leading characteristics. In France, which stands preëminent as a wine-producing country, vineyards are found in almost every department; but the principal districts or centers round which the different classes of wines are grouped are Bordeaux, Burgundy, Rhône, Champagne, and the S. of France. The Gironde, of which Bordeaux is the center, supplies the greater portion of the light red wines we receive, and which are generally known under the name of clarets; and it includes several well-known districts, such as the Medoc, the Graves or Sauterne district, St. Emilion, and others. The Medoc furnishes the best wines of this part of France, and in the same division are some of the most important vineyards. Among these are the famous names of Chateau Margau, the property of a Spanish banker, the Marquis Aguado; Chateau Lafitte, the property of the banking-house of the Rothschilds; and Chateau Latour. The white wines of this district are generally known as Sauternes, among which is included the Chateau Yquem. The total annual produce of red and white wines in the Bordeaux district is estimated at about 90,000,000 of gallons. The name Burgundy is applied to the produce of the E. central districts of France most favorable to the cultivation of the vine, which also yield red wines of the highest quality. Among the most celebrated of these are Romanée Conti, Chambertin, Clos, Vougeot, and La Tâche, all grown in the Côte d'Or, or "golden hillside," a low chain of hills extending from Dijon to Mâcon, on the Saone. The Rhône district is principally known in England from its production of Hermitage. Champagne is produced in several departments of France, including the Loire and the Jura, but the more important and valuable qualities are the produce of a district in the department of Marne, part of the former province of Champagne. The best qualities are obtained only in the prefectures of Rheims and Epernay. The production of champagne has increased enormously. Of the S. of France wines, that of Rousillon is one of the best known.

Of German wines, the most highly-esteemed are those which are produced on the banks of the Rhine, which have been aptly termed "the gardens of the vine," and the other most notable districts are those of the Mayn and the Moselle. The finer descriptions of Rhine and Mayn wines are generally known in England under the term Hock, though Hock, strictly speaking, is the produce of Hochheim, on the Mayn. With the exception of Assmannhausen, a red wine grown at Assmannhausen, a little below Rudesheim, the wines of Germany are nearly all of the white description. The best-known vineyards are those of Johannisberg, Steinberg, Marcobrunn, Rudesheim, Hochheim, and Raventhal. The district in which most of them are situated, known as the Rheingau, has attained a world-wide celebrity for its produce. The Johannisberg, which may be said to be the most famous of all, is a conical hill, projected from the Taunus Mountain, and rising about 150 feet above the level of the Rhine. It varies considerably in inclination, but the upper third, which is protected by the high castle from N. and E. winds, produces the best wine. The property of this vineyard has frequently changed hands. At the time of the French Revolution it was in the possession of the then Prince of Orange, but it was taken from him after the battle of Jena, and given by Napoleon to Marshal Kellermann. In 1815 the Emperor of Austria took possession of it, and in the following year it was given to Prince Metternich, and still remains in the possession of his family. The preparation of the wine is carried through with the utmost care, and those bottles which are to be sent to a distance are packed with every precaution to ensure their safety. The brand of the Metternich arms is placed on each cork, and a label is placed on the bottle stating the name, year, and price of the wine which it

contains. A well-known writer on wines says that "a fine bottle of mature Johannisberg Castle is, by the fullness of its taste and the mass of its bouquet, the finest and most powerful drink on earth."

Of the same class generally with the wines of France and Germany are those of Hungary, which produces an excellent wine of a claret kind. Carlowitz is becoming extensively used as a light wine. Tokay is the most famous of all Hungarian wines; and among vintages found in the market may be mentioned Œdenburger, Somlauer, Ruster, Erlauer, and Ofener. These wines have from about 11 to 14 per cent. of alcohol, and possess the reputation of being somewhat rough. The produce of the Spanish peninsula is of a different character from the wines already described, being generally of the descriptions known as ports and sherries, the strongest of all kinds of wines, and at the same time the least natural; though in some districts natural unfortified wines of excellent quality are also produced in abundant quantity. Spain, as a wine-producing country, is generally divided into three sections — the white wine or sherry district on the S. W. coast, including the province of Cadiz; the red wine district in the N. and N. E.; and the sweet wine district in the S. and S. E. In the first of these is situated Xeres, an important vine-growing district of many thousand acres in extent, which yields the best quality of sherry. The sherry and port exported to foreign countries have an additional amount of alcohol, in the shape of grape spirit, put into them after fermentation in order to preserve them, and they are artificially sweetened. This adds considerably to their strength, and gives it more body and keeping power than is possessed by the lighter natural wines. Malaga wine is a sweet luscious wine of great body, which is produced in the province of that name. The best-known port — the characteristic wine of Portugal — so far as concerns the foreign market, is Bucellas, which is said to have been made originally from transplanted Rhenish vines. Madeira, the produce of the island of that name, is a wine similar in character to sherry, and like it the various qualities are usually fortified by the addition of grape spirit. It is of great enduring quality, and is much improved by age and keeping. It is the practice to ship it to the East or West Indies, in order to bring it to proper maturity. Other varieties of wine are those of Marsala from Sicily, and Greek and Cyprian wines. Of Cape wines little is exported in a natural condition; most of what is imported being used to produce strong brandied liquids in imitation of sherry and port. The Cape wines have not, however, a high reputation for delicacy or bouquet.

**Wine, American.** The first production of wine from native grapes in the United States was in Florida in 1665; but no important attempt to develop wine making in the United States was made till 1828, when Nicholas Longworth, of Cincinnati, engaged in the business. The wine produced by him was a white wine made from the Catawba grape, and resembling Rhine wine. The industry was also soon after developed in Missouri, this State, with Ohio, having an annual yield of 3,000,000 gallons. More recently the industry has been largely developed in New York. Hammondsport, N. Y., is the center of a large wine-producing region, where large quantities of sparkling wine or champagne are produced. Since 1862 excellent wines have been made at Egg Harbor, Vineland, and Passaic, N. J., the best being a red wine, some of which resembles Bordeaux, others Burgundy. Several others of the Eastern States produce wine. Native grapes are used, the Catawba and Ives Seedling being favorites in the North, while in the South the Virginia Seedling and the Scuppernong grapes are the favorites. The Scuppernong yields an amber wine of musky flavor and strong bouquet. The wines of the E. part of the country are much more acid than those of the Pacific coast, which have the mild and sweet character of those of Spain. California is far the greatest wine-producing State of the Union, its wines being made from the European grape, which was introduced by the Franciscan fathers about 1769. The principal varieties of French, German, and Spanish grapes have since been introduced, the result being the production of several descriptions of wine which have a resemblance to the leading European types.

**Winebrenner, John,** an American clergyman; born in Frederick co., Md., March 24, 1797; was ordained in the German Reformed Church in 1820; and in the same year was called to the Salem Church in Harrisburg, Pa. He retained his connection with that charge till 1827, when, owing to his religious views on temperance and slavery, he was asked to withdraw; and in 1828 his connection with the Reformed Church ceased by action of the synod. In October, 1830, he established a new denomination under the name of the "Church of God" (*q. v.*), whose members became known as Winebrennerians. Subsequently he edited the "Gospel Publisher" (afterward the "Church Advocate"); issued "The History of all the Religious Denominations in the United States"; published the "Pronouncing Testament and Gazetteer of the Church of God"; "A Treatise on Regeneration"; "Practical and Doctrinal Sermons"; etc., and compiled the "Church Hymn Book." He died in Harrisburg, Pa., Sept. 12, 1860.

**Wine Cooler,** a tub or bath in which bottles of wine are surrounded by ice to render the contents more palatable in warm weather. They are made of various materials. An ordinary variety consists of a porous vessel of earthenware, which, being dipped in water, absorbs a considerable quantity of it. A bottle of wine being placed in the vessel, the evaporation which takes place from the vessel abstracts heat from the wine. Wine coolers for the table are made of silver or plated metal, and have ice placed in them.

**Wine Measure,** an old English measure by which wines and spirits were sold. In this measure the gallon contained 231 cubic inches, and was to the imperial standard gallon as 5 to 6 nearly.

**Wine Press,** a machine, apparatus, or place in which the juice is pressed out of grapes. The wine press of the Bible was a vat, in which the juice was expressed by the feet of men who trampled the fruit therein, staining their legs and garments with the color of the must.

**Winer, Georg Benedikt,** a German New Testament scholar; born in Leipsic, Germany, April 13, 1789, studied there, and became privat docent and Professor Extraordinary in Theology. He was called to a chair at Erlangen in 1823, but returned as ordinary professor to Leipsic in 1832. Of his numerous works first in importance stands his invaluable and still unequalled "Grammar of New Testament Idioms" (1821). No less admirable are his "Biblical Researches" (1820), a storehouse of sound learning and sagacity, and the invaluable "Handbook of Theological Literature" (1821). Winer also edited, with Engelhardt, the "New Critical Journal of Theological Literature" (1824–1830), and, unaided, the "Periodical of Scientific Theology" (1826–1832). He died in Leipsic, March 12, 1858.

**Wines, Enoch Cobb,** an American penalogist; born in Hanover, N. J., Feb. 17, 1806. He became secretary of the New York State Prison Association in 1862, and afterward devoted his life to the promotion of reform in the administration of criminal law and treatment of criminals. His writings include: "Two Years and a Half in the Navy" (1832); "A Trip to China" (1832); "Hints on Popular Education" (1838); "Commentaries on Laws of Ancient Hebrews" (1852); "Adam and Christ" (1855); "Prisons and Reformatories in the United States and Canada" (1867); "State of Prisons and Child-Saving Institutions" (1880). He died in Cambridge, Mass., Dec. 10, 1879.

**Wines, Frederick Howard,** an American statistician; born in Philadelphia, Pa., April 9, 1838; was graduated at Washington College, Pa., in 1857, and at Princeton Theological Seminary in 1865; was a chaplain in the Union army in 1862–1864; pastor of the First Presbyterian Church, Springfield, Ill., in 1865–1869; became secretary of the Illinois State Board of Commissioners of Public Charities in 1869, and its president in 1893. He was made assistant director of the United States census in 1899. His publications include "Defective, Dependent, and Delinquent Classes in the United States" (10th Census); "Crime, Pauperism, and Benevolence in the United States" (11th Census); "Punishment and Reformation" (1895); "Liquor Problem in Its Legislative Aspects"; etc.

**Winfield,** a city and county-seat of Cowley co., Kan.; on the Walnut river, and on the Missouri Pacific, the St. Louis and San Francisco, and the Atchison, Topeka, and Santa Fé railroads, 40 miles S. E. of Wichita. It contains Southwest Kansas College (M. E.), St. John's College (Luth.), high school, the Kansas State Institution for the Feeble-minded, waterworks, street railroads, Winfield Chautauqua Assembly occupying Island Park, National banks, and daily, weekly, and monthly periodicals. It has machine shops, flour mills, etc., but the chief industry is farming. The assessed property valuation is about $834,000. Pop. (1900) 5,584; (1910) 6,700.

**Wing,** one of those organs in animals by which flight is effected. In their most typical development, as seen in birds, wings consist of the bones of the fore limbs, specially modified to form a support and axis, while attached to this skeleton are the muscles moving the limb. Externally the skin is provided with feathers, and the whole fore limbs of the bird thus form the wings; while the bones of the shoulder girdle are modified to form a special support for the organ of flight. In the bat the wing consists of an expansion of the skin or integument, supported on four of the fingers, which are extremely long. This membrane, or patagium, extends from the fore limbs to the hind limbs, and in many cases between the hind limbs and tail as well. In such mammalia as the flying foxes, flying squirrels, flying phalangers, and in the lizards known as flying dragons, the wing is a mere expansion of skin, extending along the sides of the body, often connecting hind and fore limbs, and serving as a parachute to sustain the animals in their flying leaps from tree to tree, but in no sense serving as an organ of true flight. In insects the wing is formed of two delicate skin layers, supported on hollow tubes or *nervures*, placed in communication with the respiratory or breathing system. The wings of insects become thus related to respiration, and by

their movements probably aid in the diffusion of air through the breathing tubes.

**Wingate, George Wood,** an American lawyer; born in New York city, July 1, 1840; was educated in public schools; served with the 22d New York Volunteers during the Civil War. He originated systematic rifle practice for the instruction of the National Guard, and through his efforts the Creedmoor rifle range on Long Island was established. Here a number of international rifle contests were held. He was president of the National Rifle Association for 25 years. Mr. Wingate was the author of "Wingate's Manual of Rifle Practice" (1872); "The Great Cholera Riots" (1880); "On Horseback Through the Yellowstone" (1886); "History of the 22d Regiment" (1896); etc.

**Winged Bull,** an architectural decoration of frequent occurrence in ancient Assyrian temples, where winged human-headed bulls and lions of colossal size usually guarded the portals. They were evidently typical of the union of the greatest intellectual and physical powers. For illustration see ASSYRIA.

**Winged Lion,** the symbol of the evangelist St. Mark, adopted as the heraldic device of the Venetian republic, when St. Mark supplanted St. Theodore as the patron saint of Venice. A celebrated bronze figure of the winged lion of St. Mark, surmounting a magnificent red granite column formed out of a single block, stands in the Piazzetta of St. Mark at Venice.

**Wing-gudgeon,** a metallic shaft forming a journal for water or other wheels having wooden axles. The wings are let into the ends of the wood and confined by wrought-iron bands, put on hot, which become tight by shrinking.

**Winifred, St.,** according to the legend, a noble British maiden, whose head the Prince Caradog cut off because she repelled his unholy proposals. The head rolled down a hill, and where it stopped a spring gushed forth — famous after as a place of pilgrimage, Holywell in Flintshire. The saint's head was replaced by St. Bueno, and St. Winifred survived the miracle 15 years.

**Winklerite** (after Dr. C. Winkler), an amorphous mineral occurring with various other species at Pria, near Motril, Spain; hardness, 3.0; sp. gr. 3.432; color, bluish to violet-black; streak, dark-brown; fracture, conchoidal. Analyses showed a compound of an arsenate of cobalt and copper mixed with a carbonate. A very doubtful species.

**Winkworthite** (after Winkworth, Nova Scotia, where found), a mineral described by H. How as occurring in nodules imbedded in gypsum; hardness, 2 to 3; luster, glistening; colorless to white. Analyses yield varying proportions of sulphuric, boracic, and silicic acids, with the lime and water fairly constant. Probably a mixture.

**Winnebago,** a lake in Wisconsin; in the basin of the Fox river. It is 26 miles long and 10 broad, and has an area of 212 square miles. Both the river and the lake are navigated by steamboats, and afford good fishing.

**Winnipeg,** a city of Manitoba, Canada, capital of the province and chief city of the Canadian Northwest; situated at the junction of the Red and Assiniboine rivers, and on the Canadian Pacific, Canadian Northern, Grand Trunk Pacific, and Great Northern railways; 40 miles S. of Lake Winnipeg, 60 miles N. of the boundary line between Canada and the United States, and nearly midway between the Atlantic and Pacific oceans. It is only 755 feet above sea level, as compared with Calgary, which has an elevation of 3,430 feet. St. Boniface (*q.v.*), on the opposite side of Red river, is a separate municipality, with a population in 1906 of 5,119, and is notable as the chief center of Roman Catholic influence in the Canadian Northwest. On the S. side of the Assiniboine river, three and a half miles from the city, is the suburb of Tuxedo Park, containing the Manitoba Agricultural College. On the N. bank of the same river, 4½ miles from the city, is "Silver Heights," the splendid model farm of Lord Strathcona. The climate of the city and vicinity is dry, healthy, and invigorating, with sunlight during most of the year. The leading business streets are Main street, Portage avenue, and Princess street; the leading residential streets Broadway, Assiniboine avenue, Wellington Crescent, Roslyn road, Crescentwood, and Armstrong's Point.

*Buildings and Parks.*—The principal buildings are the Parliament buildings, law courts, city hall, post office, Carnegie Library, Fort Osborne barracks and drill hall, Manitoba University, with the affiliated institutions of Manitoba College, Wesley College, and St. John's College; the Hudson's Bay Company's stores, Union Bank, Merchants' Bank, Bank of Toronto, Canadian Bank of Commerce, and other bank buildings, and several business blocks. There are eleven public parks, with a total area of 315 acres, including a large suburban park of 282 acres situated on the banks of the Assiniboine river in the municipality of St. Charles. The herd of buffaloes owned by the city, and also a number of other animals, are kept in this park. River park and Elm park, the two chief parks in the city limits, are in the Fort Rouge district, adjoining Red river. There are also Fort Garry, Selkirk, St. John's Central, Assiniboine, Victoria, Notre Dame, and St. James parks. Broadway, the chief residential

Winnipeg

street, is a wide and beautiful thoroughfare of parklike appearance, adorned with rows of trees. In the N. W. part of the city the Industrial Exhibition grounds, in which the leading agricultural and stock show of the western half of Canada is annually held, contain several large buildings. In front of the city hall is the Volunteers' monument, in memory of those who fell at Fish Creek and Batoche during the Northwest Rebellion of 1885. The Seven Oaks monument commemorates the site of a fierce conflict between the rival Hudson's Bay and Northwest fur companies in 1817, four years before their amalgamation took place. Other places of scenic and historic interest are Upper Fort Garry, which in 1870 was the nucleus of the Winnipeg of to-day, and the old Fort Garry gate. Eight bridges across the Red and Assiniboine rivers connect the city with St. Boniface and the Fort Rouge district.

*Churches and Educational Institutions.*—There are about seventy churches, many of which are of fine design. Among them are Holy Trinity and St. Stephen's (Anglican), Knox (Pres.), Grace (Meth.), and St. Mary's (R. C.). Owing to the cosmopolitan character of the population, nearly every well-known form of Christian faith is represented by one or more places of worship. Winnipeg is the center of education for Manitoba and the Northwest, and is the seat of Manitoba University, a central degree-conferring body with five affiliated institutions—Manitoba College (Pres.), Wesley College (Meth.), St. John's College (Ang.), St. Boniface College (R. C.), and Manitoba Medical College. Other educational institutions are the provincial normal school, Havergal College (Ang.), St. Mary's Academy (R. C.), the Collegiate Institute, and twenty public schools. The two leading libraries are the Carnegie Public Library and the Winnipeg Free Public Library in the city hall.

*Clubs, Theaters, and Hotels.*—The principal clubs are the Manitoba and the Commercial. There are the Walker, Winnipeg, Dominion, and Bijou theaters. Of the numerous hotels the principal are the Royal, Alexandra, Queen's, Empire, Clarendon, and Leland.

*Charities and Newspapers.*—The charitable institutions include the city general hospital, provincial deaf and dumb institute, children's home, women's home, etc. There are three daily newspapers, the Manitoba "Free Press," the Winnipeg "Telegram," and the Winnipeg "Tribune." There are also numerous weekly and monthly publications.

*Industry, Commerce, etc.*—Winnipeg is the manufacturing and commercial center of western Canada; it exports more grain than any other city in the British Empire, and more wheat than any other city on the American continent. As a leading point of junction for all the Canadian trunk lines, it has unsurpassed facilities for land transportation in the Dominion, and it is also connected with the trunk lines of the United States. Sixteen tracks, owned by six railway systems, radiate from the city in all directions. Steamboats ply to various points on the Red and Assiniboine rivers, but irregularly. In 1907 active work was in progress on the construction of locks at St. Andrew's rapids on the Red river, for the purpose of opening navigation for lake steamers from the head of Lake Winnipeg to the upper reaches of the Red river S. of Winnipeg. The construction of locks will also insure navigation from Lake Winnipeg up the Saskatchewan river for 1,000 miles. The great impetus to the manufacturing interests and the wholesale and jobbing trade of Winnipeg comes from the position of the city as chief source of supply for the wants of immense areas recently opened to immigration and devoted to grain production, stock raising, cattle breeding, mining, lumbering, and fishing. In the surrounding district, besides the grain, lumber, fish, and live-stock production, minerals are found, including marl, gypsum, asbestos, clays, sandstone, glass sand, and iron. The city was constructing in 1907 a municipal electric power plant on Winnipeg river for the development of 50,000 horse power for manufacturing purposes. The industrial establishments include lumber and flour mills (among the latter the Ogilvie mill, the largest in Canada), foundries, machine shops, breweries, and manufactories of clothing, leather, boots and shoes, confectionery, soap, carriages and wagons, tents, awnings, mattresses, furniture and upholstery, tinware, cigars, plumbing and gas fixtures, etc. The output of manufactured articles, according to the Dominion census, was $8,616,248 in 1901; and this had increased to $18,983,290 in 1906, or 120 per cent. in five years. The annual wholesale business in 1906-07 amounted to $85,000,000. The imports had increased from $3,463,150 in 1900 to $17,556,273 in 1906, or 406 per cent. These figures do not represent the real total, as large quantities are brought in through Eastern customs ports and the entries are made there. Of the exports, the chief article is grain, which amounted in 1905 to more than 60,000,000 bushels. In 1903 the wheat receipts of Winnipeg were 51,833,000 bushels, as compared with 42,406,923 bushels for Duluth-Superior, and 37,940,953 bushels for Chicago. The bank clearances increased from $106,956,720 in 1900 to $504,585,914 in 1906.

*Government, Finance, etc.*—The city government is carried on under a charter from the provincial legislature, and consists of a mayor, four controllers forming a board of

control, and fourteen aldermen. The board of control is the executive body and generally administers the affairs of the city, except as to the public schools and police department, the former being under control of the public school board and the latter under a board of police commissioners. The city owns and operates its water works, electric street lighting, asphalt plant, and stone quarry. The total assessed value of taxable property in 1907 was $96,815,500. The total receipts for the fiscal year 1906 were $3,451,082; total expenditures, $4,156,283. The total assets for 1906 amounted to $3,295,193; the total liabilities to $3,298,334.

*History and Population.*—The first settlement on the site of the present city was established in 1738 and named Fort Rouge by Sieur de la Verendrye and his sons. The settlement was abandoned after the British conquest of Canada in 1759. In 1803 the Northwest Fur Company established Fort Gibraltar at the junction of the Red and Assiniboine rivers, and the Hudson's Bay Company established posts in the surrounding district in 1796. In 1812 Lord Selkirk's Scottish colonists came to Fort Gibraltar. A series of conflicts among the colonists and the rival companies ensued, and the latter were amalgamated in 1821. The Hudson's Bay Company then built Fort Garry on part of the present site of Winnipeg. In 1870, when Manitoba was created a province of the Dominion, there was a rebellion of French half-breeds under Louis Riel (*q.v.*), but it was suppressed by troops under General Wolseley, who made a famous overland march for that purpose. Winnipeg is the most cosmopolitan of Canadian cities in its population, being the distributing point for immigrants from all the countries of Europe. The following figures show the growth in population: Pop. (1870) 215; (1874) 1,869; (1885) 19,574; (1898) 39,389; (1901) 42,340; Dom. census (1906) 90,204; official estimate (1910) 130,000.

**Winnipeg,** a lake of Canada, in the province of Manitoba; length, about 250 miles; breadth, from 5 to 70 miles. It receives the surplus waters of Lakes Winnipegoos and Manitoba, besides the Winnipeg river, but its chief tributaries are the Saskatchewan and the Red river. Its surplus water is discharged by the Nelson river into Hudson Bay. The river of the same name, which flows into Lake Winnipeg, rises in the Lake of the Woods, and has a length of about 250 miles. Its navigation is interrupted by falls.

**Winnipiseogee Lake,** a lake in New Hampshire. Its length is 25 miles, its breadth varies from 1 to 10 miles; area 175 square miles; elevation above sea-level, 472 feet. It discharges by the Winnipiseogee river, an affluent of the Merrimac.

**Winona,** a city and county-seat of Winona co., Minn.; on the Mississippi river, and on the Winona and Western, the Burlington Route, the Green Bay, Winona, and St. Paul, the Chicago, Milwaukee, and St. Paul, and the Chicago and Northwestern railroads; 104 miles S. E. of St. Paul. Here are a United States government building, court house, State Normal school, Winona Seminary, St. Mary's Academy, commercial colleges, library, hospital, street railroad and electric light plants, waterworks, National, State, and savings banks, and several daily and weekly newspapers. A fine railroad bridge crosses the Mississippi river at this point. The amount of wheat shipped from Winona is said to exceed that of any other city excepting Chicago and Milwaukee. The city has flour mills, sawmills, foundries, gas works, carriage factories, tannery, barrel factories, and manufactories of sashes and doors, farming implements, etc., and an assessed property valuation exceeding $6,600,000. Pop. (1900) 19,714; (1910) 18,583.

**Winslow, Edward,** a "Mayflower" emigrant and governor of Plymouth Colony; born in Droitwich, England, Oct. 19, 1595. He was a hostage to Massasoit, his account of which was in George Morton's "Relation" (1622). He was the author of "Good Newes from New England," etc. (1624), printed in full in Young's "Chronicles of the Pilgrim Fathers" (1841); "Brief Narration; or, Hypocrisie Unmasked," etc. (1646), and other works mainly of a religious character. He died at sea, between Santo Domingo and Jamaica, May 8, 1655.

**Winslow, Forbes Benignus,** an English alienist; born in London, of a Massachusetts family, in August, 1810; was educated in Scotland and near Manchester, and after studying medicine at New York and the London University, passed the College of Surgeons (1835), and took his M. D. at Aberdeen. With his earliest practice he combined the duties of a "Times" reporter, but having after 1830 paid special attention to the study of insanity, he opened a private asylum at Hammersmith (later another in London), and rose in time to be the supreme authority on all relating to diseases of the brain. He published "The Application of Phrenology to the Elucidation and Cure of Insanity" (1831); "Anatomy of Suicide" (1840); "Plea of Insanity in Criminal Cases" (1843); "Notes on the Lunacy Act" (1845); "Softening of the Brain" (1849); "Lettsonian Lectures on Insanity" (1854); "Obscure Diseases of the Brain and Disorders of the Mind" (1860; 4th ed. 1868); "Light, its Influence on Life and Health" (1867); etc. He died in Brighton, England, March 3, 1874.

**Winslow, John Ancrum,** an American naval officer; born in Wilmington, N. C., Nov. 19, 1811; entered the navy about 1827, became a lieutenant in 1839, and commander in 1855. In 1862 he served under Captain Foote on the Mississippi river. He obtained command of the steamer "Kearsarge," of seven guns, and was ordered to the coast of Europe, to watch Confederate cruisers, in the early part of 1863. On June 19, 1864, he met the "Alabama," Captain Semmes, near Cherbourg. When the vessels were about a mile apart, the "Alabama" began to fire rapidly and wildly, but the guns of the "Kearsarge" were directed with coolness and precision. The vessels fought in circles, swinging steadily around an ever-changing center. After they had described seven circles and had diminished their distance to about a quarter of a mile, the "Alabama" began to sink, and raised a white flag. Captain Winslow lost only three killed and wounded out of 163 officers and men. He took 65 prisoners. He was promoted commodore in 1865 and rear-admiral in 1870. He died in Boston, Mass., Sept. 29, 1873.

**Winslow, Miron,** an American missionary; born in Williston, Vt., Dec. 11, 1789. He went as a missionary to Ceylon, 1819; founded the Madras mission, 1836; was president of the native college at Madras, 1840; translated the Bible into Tamil, 1835; and wrote: "Memoir of Mrs. Harriet Winslow" (1835), his wife, republished in England, and translated into French and Turkish; and "A Tamil and English Dictionary" (1862), his great work, containing over 67,000 Tamil words. He died at the Cape of Good Hope, Oct. 22, 1864.

**Winslow, William Copley,** an American archæologist; born in Boston, Mass., Jan. 13, 1840. He was an Episcopal clergyman; assisted in founding the "University Quarterly," 1861; edited the "Hamilton," 1862; was assistant editor of the New York "World" 1862–1863, and editor of the "Christian Times" 1863–1865; vice-president, secretary, and treasurer for many years of the Egypt exploration fund for the United States; lecturer on archæological subjects and colonial history. He wrote: "Israel in Egypt"; "The Store City of Pithom" (1885); "A Greek City in Egypt" (1887); "The Egyptian Collection in Boston" (1890); "The Pilgrim Fathers in Holland" (1891); "Governor Edward Winslow"; "The Winslow Memorial"; etc.

**Winsor, Justin,** an American historian; born in Boston, Mass., Jan. 2, 1831. He was superintendent of the Boston Public Library in 1868–1877, and librarian of Harvard University in 1877–1897. He published: "Bibliography of Original Quartos and Folios of Shakespeare" (1875); "Reader's Handbook of the American Revolution" (1880); "Memorial History of Boston" (edited, 1880–1882); "Narrative and Critical History of America" (edited: 8 vols., 1884–1889); "Christopher Columbus" (1891); "From Cartier to Frontenac" (1894); "The Mississippi Basin"; and "The Struggle in America between England and France" (1895). He was the highest authority on the early history of North America. He died in Cambridge, Mass., Oct. 22, 1897.

**Winston,** a city and county-seat of Forsyth co., N. C.; on the Southern, and the Northern and Western railroads; 120 miles W. by N. of Raleigh. It is joined to the city of Salem. The interests of the two cities are nearly identical and they are usually designated as one city, being called Winston–Salem. Here are an academy, numerous churches, National banks, and daily and weekly newspapers. It has cotton and woolen mills, shuttle and bobbin works, an iron foundry, and many large tobacco shops, and an assessed property valuation of nearly $3,800,000. Pop. (1890) 8,018; (1900) 10,008; (1910) 17,167.

**Winter,** the cold season of the year. Astronomically considered, winter begins in N. latitudes when the sun enters the sign of Capricorn, or at the solstice about Dec. 21, and ends at the equinox in March; but in its ordinary sense it is taken to include the months of December, January and February.

**Winter, William,** an American dramatic critic; born in Gloucester, Mass., July 15, 1836. He did journalistic work on the "Saturday Press," "Vanity Fair," the "Albion," "Weekly Review"; and was dramatic critic for the New York "Tribune" from 1865. He wrote "The Convent, and Other Poems" (1854); "The Queen's Domain" (1858), and "My Witness" (1871), poems; "Life of Edwin Booth" (1872); "Thistledown" (1878), poems; "Poems," complete edition (1881); "The Jeffersons" (1881); "English Rambles" (1883); "Life of Henry Irving" (1885); "Shakespeare's England" (1886); "Stage Life of Mary Anderson" (1886); "The Wanderers" (1888); "A Wreath of Laurel" etc.

**Winterbergen,** a lofty mountain range in the E. of Cape Colony, forming a part of the great dividing chain, sometimes called "the backbone of South Africa." Its culminating point, the Great Winterberg Peak, is 7,806 feet high.

**Winter Cherry,** the *Physalis alkekengi;* a downy herb, with a creeping, perennial root, ovate, deltoid leaves, an inflated, reddish-yellow calyx, a campanulate-rotate corolla of a dirty white color, and a red fruit.

So named from its red, cherry-like berry, so conspicuous in winter.

**Winter Cress,** the common name of two cruciferous plants of the genus *Barbarea*. *Barbarea vulgaris*, called also yellow rocket, grows on the banks of ditches and rivers, and about hedges and walls. It is bitter and sharp to the taste, and is sometimes used as a salad.

**Wintergreen,** a name of several plants, one of them being the partridge berry. The name is also given to a genus of perennial plants (*Pyrola*), order *Pyrolaceæ*, having short stems, broad evergreen leaves, and usually racemose white or pink flowers. *P. rotundifolia* possesses astringent properties and was formerly used in medicine.

**Wintergreen Oil.** The manufacture of the oil of wintergreen, in the United States, is carried on chiefly in New York and Pennsylvania, where the wintergreen vine and birch trees grow in abundance. Wintergreen is a plant common in nearly all parts of the country, but not in every part do the inhabitants thereof make the oil of wintergreen. The makers of wintergreen essence are under the surveillance of the government.

The oil is made from wintergreen when wintergreen is abundant. If it is not plenty, birch is used. The plant of an oil maker consists of a furnace made of rough stones, a boiler, a tin pipe, a trough, a barrel and a running brook. The tin pipe leads from the top of the boiler through the water in the trough to a barrel. Under the end of the pipe is placed a barrel and on the end of the pipe in the barrel is hung a glass jar. The boiler is filled with water and birch bark and wintergreen twigs. A fire is built, the steam is forced through the tin pipe, and is condensed by the pipe's passing through the water in the trough. The oil of wintergreen and the water fall into the glass jar, but the oil, being heavier than the water, goes to the bottom of the jar, while the water runs over into the barrel and is used again.

The business is carried on in certain seasons both day and night, as the pot must be kept boiling. The men who work at this business make their homes during the season in the forest or field wherever the birch or wintergreen is to be found. They enjoy an all-season picnic unless the internal revenue collector "drops down" on them, as he has done on many, and collects $36 for every still-like apparatus he finds. It is supposed that some of the rude affairs for condensing, which the government calls stills, are so concealed in the forest that the collector does not find them. The manufacturers dispose of the oil to apothecaries for about $2 a pound, who, after diluting with alcohol, sell it to confectioners and others at the usual apothecaries' profits.

**Winterhoek Mountains,** a range in Cape Colony whose termination is about 30 miles N. W. of Port Elizabeth. Its loftiest peak, the Cock's comb, is estimated to be 8,000 feet high, and, though 20 miles inland, is visible 60 miles out at sea. There is also a Winterhoek Peak, 6,840 feet high, 75 miles N. E. of Cape Town, whence it is visible.

**Winter Moth,** a moth (*Cheimonobia brumata*), the larvæ of which are exceedingly injurious to apple, pear, cherry, and plum trees. The moths appear in their perfect state in the beginning of winter.

**Winter's Bark** (*Drimys Winteri*), a plant of the natural order *Magnoliaceæ*, a native of South America. It is an evergreen shrub, the bark of which has an agreeable, pungent, aromatic taste, and tonic properties.

**Winter Weed,** a popular name for any small weed in corn which survives and flourishes during the winter, as *Stellaria media* (chickweed), *Veronica hederifolia*, etc. The last-named species is so called from its being the weed which spreads most in winter.

**Winther, Rasmus Villads Christian Ferdinand,** a Danish poet; born in Fensmark, Denmark, July 29, 1796. He was one of the truest interpreters of the Danish national character. Some of his numerous publications are: "Song and Legend" (1841); "Lyrical Poems" (1849); "New Poems" (1850); "The Flight of the Hart" (1850), a lyric romance of the Danish Middle Ages, his greatest work. He died in Paris, France, Dec. 30, 1876.

**Winthrop, John,** first governor of Massachusetts; born in Groton, England, Jan. 22, 1588. He came with the first colonists to Salem in 1630 as their governor, and remained in that office, with the exception of six or seven years, till his death. He left a journal of the proceedings of the colony, which has been published, and is a valuable contribution to the early history of Massachusetts. He died in Boston, March 22, 1649. His son, JOHN, born in Suffolk, England, Feb. 12, 1606, arrived in Massachusetts in 1633. On returning to England he collected a body of colonists and settled with them in Saybrook, Conn., and was appointed their governor, retaining the office till his death. He was devoted to scientific pursuits, and had the honor of being one of the founders of the Royal Society of London. He died in Boston, April 5, 1676.

**Winthrop, Robert Charles,** an American statesman; born in Boston, Mass., May 12, 1809; was graduated at Harvard College in 1828; studied law with Daniel Webster, and was admitted to the bar in 1831.

He soon left law for politics and in 1843 was elected to the State Legislature, where he served five years, three as Speaker of the House. In 1840 he was elected to Congress, serving for 10 years, two years as speaker. He was appointed Webster's successor in the United States Senate in 1850, and served one year, after which he retired from public life. He died in Boston, Mass., Nov. 16, 1894.

**Winthrop, Theodore,** an American military officer; born in New Haven, Conn., Sept. 22, 1828; was graduated at Yale College in 1848; traveled extensively; studied law, and joined the 7th New York Regiment in 1861. The 1861 "Atlantic Monthly" contained sketches from him of early war scenes. He left completed material for five volumes of novels and essays: "Cecil Dreeme" (1861); "John Brent" (1862); "Edwin Brothercroft" (1862); "The Canoe and the Saddle" (1862); and "Life in the Open Air, and Other Papers" (1863). His sister published "Life and Poems of Theodore Winthrop" (1884). He was killed at the head of an assaulting column of Northern troops at Big Bethel, Va., June 10, 1861.

THEODORE WINTHROP.

**Winthrop, Fort,** one of the defenses of Boston harbor.

**Wiper,** in machinery, a cam which projects from a horizontal shaft and acts periodically upon a toe whose elevation lifts the valve rod and puppet valve. The wiper has usually a rotary reciprocation; when the rotary motion is continuous, it becomes a wiper wheel, which may have a number of cams acting consecutively in the course of a revolution.

**Wiper Wheel,** a cam wheel placed below the shank of a tilt-hammer to lift it periodically, allowing it to fall by its own weight. The motion is found in many other machines, such as stamping mills for ore and stone, etc.

**Wire,** a metallic rod, thread, or filament of small and uniform diameter. The largest size, numbered 0000, of the Birmingham wire-gauge, has a diameter of .454 inch; but smaller sizes ever than this, except when drawn out to considerable lengths, are generally known as bars or rods. Lead wire for the manufacture of bullets may considerably exceed the above diameter. Wire is usually cylindrical, but it is also made of various other forms, as oval, half-round, square, and triangular, and of more complicated shapes for small pinions; for forming the pattern on blocks used in calico-printing, and for other purposes. Used absolutely for telegraph wire, and hence, colloquially, applied to the telegraph itself; as, to send a message by wire. Used in hunting language for wire-fencing. Wire of Lapland is a shining slender substance made from the sinews of the reindeer, soaked in water, beaten and spun into thread. Being then coated with tin, it is used by the Laplanders to embroider their clothes.

**Wire Cloth,** a fabric whose woof and weft are of wire; the size of the wire, the shape and sizes of the meshes, being adapted to the uses of the completed screen, sifter, or sieve, or the character of the machine in which it is to be used.

**Wiredrawing,** the act or process of drawing metal into wire. The metal to be extended is first hammered into a bar or rod. The rods, from ¼ to ½ inches in diameter, received from the rolling mills in bundles, are heated and rerolled in grooved rollers, one above the other, so that the rod runs from the first roll to the second, and so on, without reheating. The rollers run with great rapidity, reducing the rod to a coarse wire, which is then passed through the successive holes in the draw plate, a flat piece of hard steel having holes corresponding to the various numbers or sizes of wire. The best are made of a combined plate of highly-tempered steel and wrought iron. The holes are tapering, the smallest opening being on the steel side through which the wire first enters. Very fine gold and platinum wires, used for the spider lines of telescopes, are formed by coating the metal with silver, which is then drawn down to a great tenuity, after which the silver coating is removed by nitric acid, leaving an almost invisible interior wire, which has been so attenuated that a mile in length weighed only a grain. Wiredrawing seems to have arisen at Augsburg or Nuremberg in the 14th century. In 1483 and 1484 the importation of iron wire into England was prohibited. The manufacture was soon after attempted in England, but did not make much progress till a patent was granted, in 1565, to certain Dutchmen and Germans to carry it and some other processes out. The first English wire mill was set up at Sheen, near Richmond, by a Dutchman, in 1662.

**Wire Fence,** a fence made of parallel strands of wire, generally galvanized,

strained between upright posts placed at suitable distances apart. Of late years wire fencing has to a considerable extent taken the place of the old hedge, board, and rail fences; being easily transferred from place to place, so as to inclose different portion of ground at different times as required. It also has the advantage of being durable and of overshadowing or occupying no cultivable ground. Usually the wire has, at intervals of about 18 inches, small barbs or prickles, which are intended to prevent cattle from running against or attempting to leap these fences. In the cattle-raising districts, however, barbed wire is objectionable for fences, as in many cases, when cattle have by accident run against these sharp points, serious wounds and great disfigurement have resulted, sometimes valuable animals dying from loss of blood before they are discovered.

**Wire Gauge,** a gauge for measuring the thickness of wire and sheet metals. It is usually a plate of steel having a series of apertures around its edge, each corresponding in width to the diameter of wire of a certain number.

**Wireless Telegraphy.** The transmission of alphabetic signals between two distant points without connecting wires by electrical methods is, in its commercial aspect, an achievement of recent date. For a century prior to what is now known as electric-wave wireless telegraphy, much effort had been directed toward the solution of this important problem; but until 1896 the results attained were so circumscribed that they were of little value.

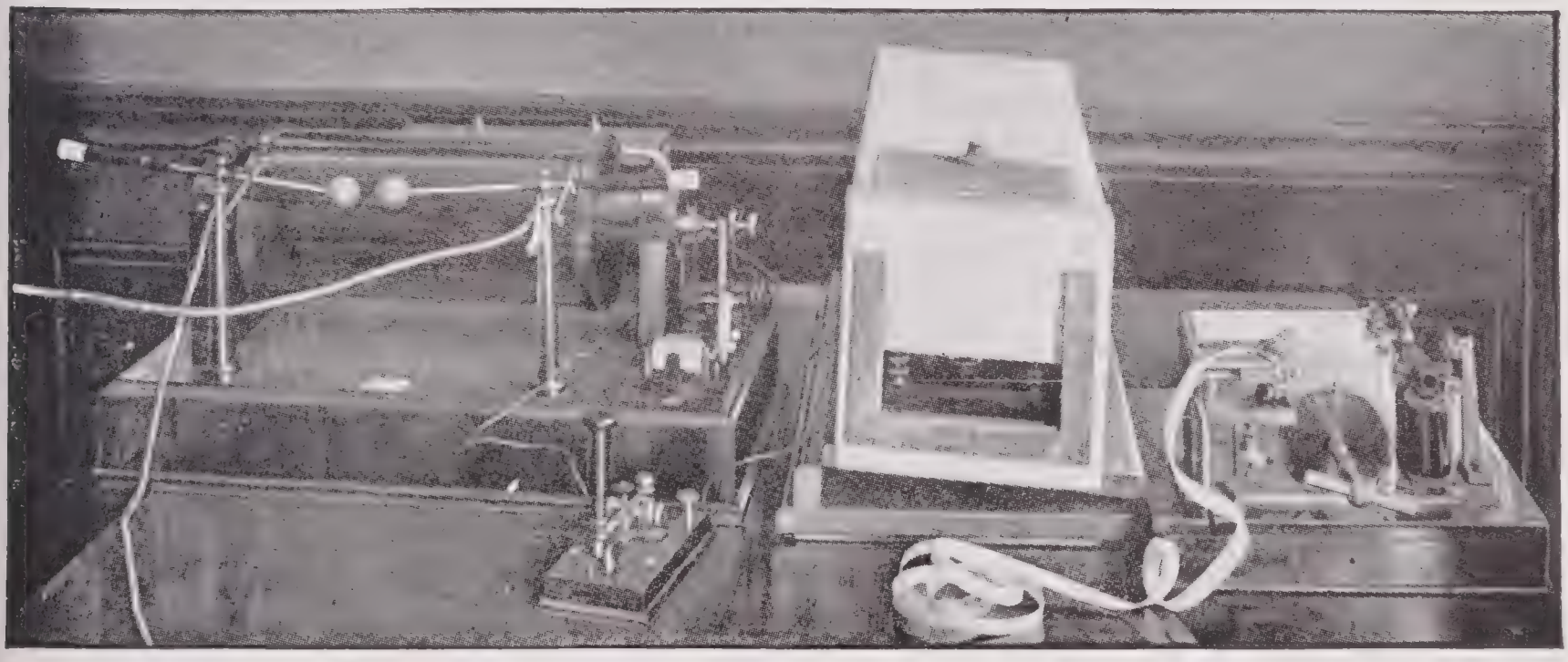
Briefly, four different schemes have been employed in the effort to transmit electrical impulses without wires, the earliest of which was based on the property of the earth and sea to propagate the energy by conduction or dispersion; the second on utilizing magnetic lines of force to loop the sending with the receiving coils of wire; the third on electro-static stresses set up between the complementary instruments; while the last and only successful method for long distance transmission was effected by means of electro-magnetic waves. These different methods have little in common, and are related only in so far as they are electrical in operation and have as their object the sending and reception of signals through space. Since the dispersion, induction and electrostatic methods have no real bearing on wireless telegraphy as it is practiced at the present time, these will not be further considered, but should a more detailed account of them be desired it may be found under the title WIRELESS TELEPHONY.

*Historical.*—The supposition that light is a wave motion of the ether and that ether is a medium filling all space not otherwise occupied by gross matter was formulated by Christian Huygens in 1678, and, starting with the latter conception, the history of wireless telegraphy may be said to have had its beginning. The conclusions of the Dutch mathematician were bitterly assailed for over a century and a half afterward, but when Michael Faraday, the great English experimentalist, demonstrated, in 1845, that light and electric forces were related, and advocated the hypothesis that they were propagated by, in and through the same medium, which was none other than Huygens' luminiferous ether, renewed interest was stimulated in the subject. Supposition and hypothesis were finally crystallized into a complete electro-magnetic theory of light by James Clerk-Maxwell, in 1869, and this powerful mathematician showed that the velocity of light waves was, assuming the errors of observation to be negligible, identical with the rate of propagation of electro-magnetic energy. This great work of Faraday and Maxwell indicated that there must be many other wave lengths propagated by the ether than the very few which the sense of sight is capable of perceiving, called the visible spectrum. The climax was reached, however, when Heinrich Hertz, a German physicist, demonstrated (1888) experimentally that ether waves could be set up by electric forces; that these waves were many times as long as those the eye can see; that they were electro-magnetic in character, just as are light waves; and, finally, that they could be reflected, refracted, polarized and made to interfere with each other exactly like light. Though Hertz's experiments were confined to delicate deductions and minute measurements in the laboratory, he may be said to have been the first to send and receive electric-wave signals across space, and for this reason wireless telegraphy is sometimes called Hertzian-wave telegraphy.

Experiments leading toward the goal of a practical system of space telegraphy now followed each other in rapid succession, and two years later, namely, in 1890, Édouard Branly, of the Catholic University of Paris, designed a detector for picking up and indicating the waves that was marvelously sensitive; and modifications of this device, called a coherer, are still in use in several of the best-known systems to-day.

With the transmitter of Hertz for emitting the waves, and the receiver of Branly for translating them, there were now needed only two slight, but withal exceedingly important additions for the completion of a commercial wireless system. These were the aërial wires and the grounds, as the conductors are called that lead from the instruments to the earth, where their terminals are buried, or the sea, where they are immersed in the water.

Experimental Station at South Foreland, showing the high pole, which is an essential feature of the Marconi system.



Transmitter. Receiver.

Apparatus in operation; message being received and read.

The first instance on record when a wire was extended vertically in the air and a grounded wire connected with a coherer to form a receiver, was afforded by Alexander Popoff of the Kronstadt Military School, Russia, in 1895. In connection with this arrangement the Russian professor used a relay, a tapper, and a bell to indicate the signals. The receiver was not, however, employed for the reception of intelligence wirelessly, but as a detector for electric storms and other meteorological observations.

This brings the history of the art to the year 1896, when William Marconi applied for his first patent on a wireless telegraph system in England, and immediately upon his arrival from Italy, submitted his invention to Sir William Preece of the Postal Telegraph Service. In his transmitter he grounded one side of the spark-gap and from the opposite side led a vertical wire into the air to a height of 50 feet or more, and there suspended it from a mast. Marconi's first experiments were made from a room in the General Post-office, London, to a receiver located on the roof of a nearby building about 300 feet distant. A few weeks later further trials took place over Salisbury Plain across a clear open space, a distance of nearly two miles. During the next year 3.3 miles across the Bristol Channel, between Lavernock and Flatholm, were successfully bridged, and then 8.7 miles were covered between Lavernock and Breen Down. In the same year many other installations were set up, and when the English Channel was spanned from South Foreland to the coast of France the world accepted wireless telegraphy as a thing that was. From this time on until Marconi signalled across the Atlantic Ocean between Poldhu, Cornwall, and St. John's, Newfoundland, on Dec. 12, 1901, the results attained with the new telegraphy were indeed spectacular, and its future, as an additional means for the transmission of intelligence, was firmly founded.

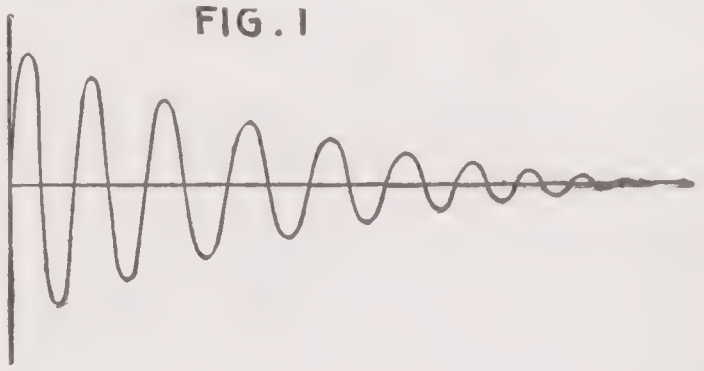
*Theoretical.*—Waves in the ether are produced by causing the latter to vibrate, and this can be accomplished only by giving electricity a rapid motion. Why this is so will be easily understood by employing a bell and the air as an analogue. The sound of a bell is the result of the vibrations of its mass propagating its energy through the air. When the first layer of air is struck by the vibrating body, the particles of this layer impart their motion to the particles of the next layer, and so on until those of the last impinge upon the ear. The length of the sound wave is measured in the direction in which the waves are traveling, and is the distance from any vibrating particle to the next particle that is in the same relative position. The ether can be made to vibrate similarly to the air, but instead

Wireless Telegraphy

of a material body being set into motion, a charge of electricity must be made to oscillate or surge to and fro on a wire several hundred thousand times per second. Light is produced by charges of electricity vibrating on atoms of matter when the period of vibration ranges from 400 billion to 750 billion times per second. Electric waves and light waves are identical in every way, though the first are of such great length that the eye is incapable of perceiving them.

There is only one way known to science by which these long waves may be produced, and this is by means of a disruptive discharge or electric spark. When two charges of electricity of opposite sign rush together, as between the knobs of an electrical machine or between two clouds, or a cloud and the earth, the strain of the charges bursts through the air, burning up the latter, and producing a vivid flash of light. When this takes place the energy of the charges does not instantly come to rest, but swings forth and back, each time becoming more feeble than the preceding, until the electrical equilibrium is restored, like the vibrations of a straight steel spring or the bell referred to. These reflex actions of the discharge are called oscillations, and are graphically shown in Fig. 1. By properly proportioning the electrical dimensions of the conductor, or circuit through which the energy oscillates, the period of time required for each

FIG. 1



oscillation may be previously determined, and hence the wave emitted may be made of any desired length. In dealing with material things, dimensions are stated in terms of length, breadth and thickness; in electric circuits, the factors are the inductance, capacity and resistance. Thus a long, thin spring would vibrate slowly, whereas a short, thick spring would move with great rapidity. Similarly, in a circuit having little inductance and capacity, a current would oscillate very fast, while a circuit possessing these factors to a considerable extent, would slow down the oscillations. To obtain these conditions in practice, a coil of wire is included in the circuit, since it possesses this property of inductance to a high degree, while condensers provide the necessary capacity. It is customary to make the inductance coils and condenser capacities adjustable, so that the period of oscillation,

Wireless Telegraphy

and therefore the wave length, may be varied to suit the exigencies of the case. In wireless telegraphy it frequently occurs that two oscillative circuits are associated, and these are tuned to each other by means of coils and condensers.

When the disruptive discharge or spark starts the oscillations surging through a circuit, the energy is damped out in the production of a strain in the ether, which takes on the form of a wave; it is in fact similar to the strain in air called a sound wave, except that the first is a transverse vibration and the latter a longitudinal thrust. The elasticity of the ether resists the emitted energy of the wave, and a magnetic flux is created in a direction at right angles to it. When the magnetic lines of force disappear, they give rise in their place to electric waves, and for this reason all ether waves are electro-magnetic in character.

An open-circuit oscillator (shown in Fig. 2) is merely a wire with both ends free, and this simple device converts all the energy with which it can be supplied into electric waves very quickly—in two or three swings—and these strongly damped oscilla-

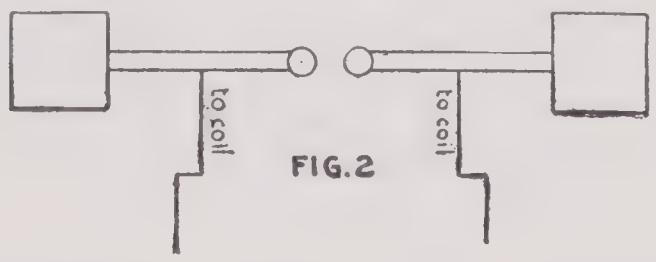



FIG. 2

tions send out powerful waves to long distances. A closed-circuit oscillator is shown in Fig. 3, and this type permits the energy to oscillate for a long time, and hence its radiating power is very feeble. It is sometimes convenient to combine the open and closed oscillator systems, as will be seen later.

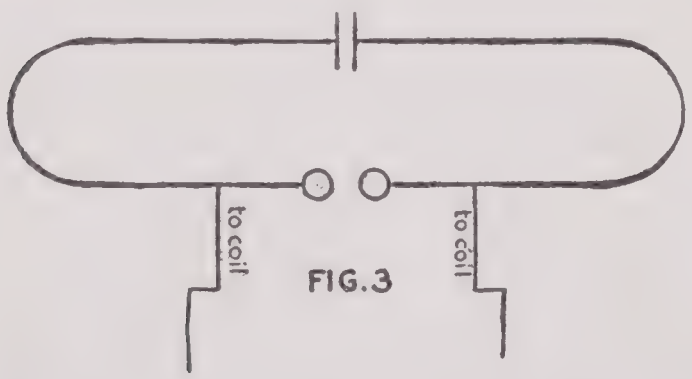
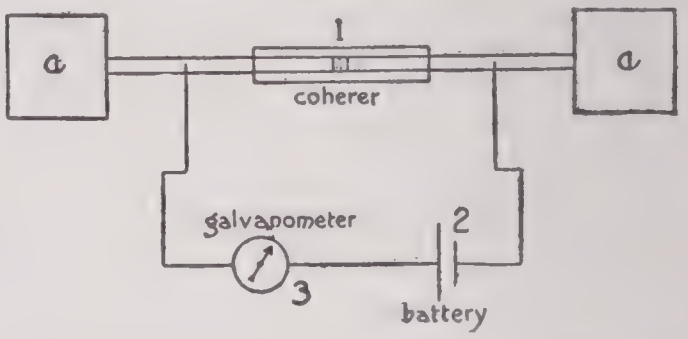



FIG. 3

When the electric waves that are sent forth by the oscillator, or emitter, are permitted to impinge upon a similar conductor with free ends, as shown in Fig. 4, or a resonator, as it is called, the energy still remaining in the waves will be reconverted into electric oscillations, which will surge through the circuit as the original electric charge did through the oscillator. If the dimensions of the resonator, i. e., its inductance capacity and resistance, are exactly of the same value as those of the oscillator, then the frequency of the oscillations will be in both instances exactly the same. The

FIG. 4




circuits are then said to be syntonized, and this in wireless telegraphy indicates that the circuits of the transmitter and receiver are in resonance one with the other. To further this timing process, a closed-circuit resonator (shown diagrammatically in Fig. 5) is often combined with one of the open-circuit type.

To indicate the presence of feeble electric oscillations in the resonator circuit, a detector, of which the coherer is the best-known form, is used. The coherer comprises

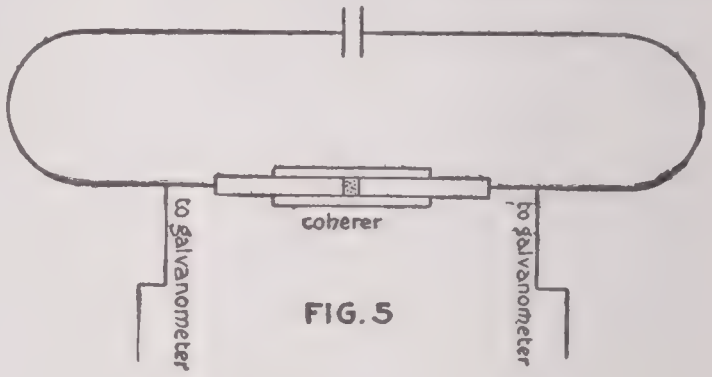



FIG. 5

a small glass tube with metal filings in a little space or pocket, as in Fig. 6, the ends of two metal plugs fitting snugly within it. The coherer is connected to the resonator circuits, as shown in the drawings. When the oscillations surge through the resonator, the pressure or potential finally breaks down the air film separating the little particles of metal and then gently welds their sharp corners and edges to-

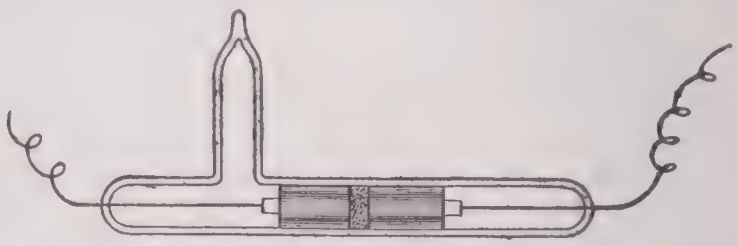


FIG. 6

gether. Before this process of cohesion takes place, they naturally offer a very high resistance to an ordinary current generated by a dry cell, so much so that no current is permitted to pass; but once the oscillations cause them to cohere, presto! the resistance drops from thousands to hundreds of ohms,

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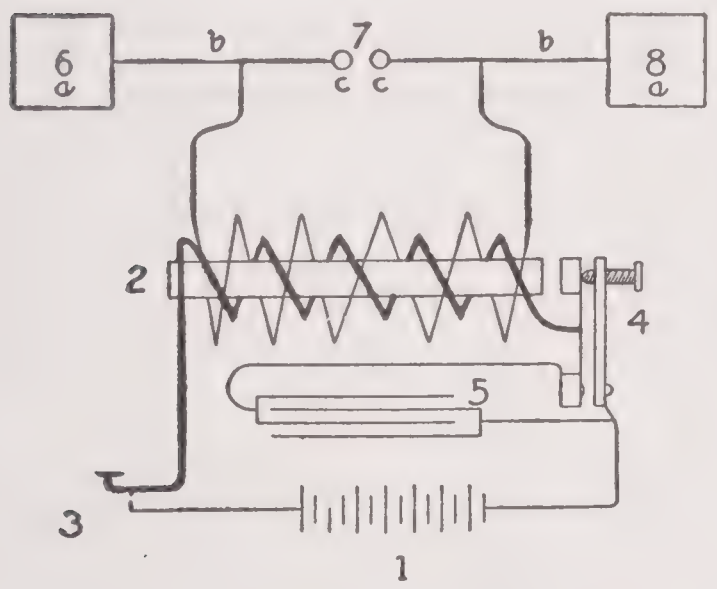
and the current from the dry cell now flows easily through the coherer, when it will deflect a needle of a galvanometer, operate a telephone receiver, or work a relay.

*Experimental.*—The following description and diagrams will make it easy to understand the construction of a transmitter for transforming low-voltage currents into high-potential charges, the latter into high-frequency oscillations, and finally these into electric waves, as well as the receiver employed for the conversion of electric waves into electric oscillations and their subsequent indication by intelligent alphabetic signs.

By referring to Fig. 7, a Hertz transmitter will be observed; a Branly receiver is shown in Fig. 4. The former comprises a battery (1), or other source of electromotive force; an induction coil (2), the heavy lines representing the primary winding, and the fine lines the secondary winding; a key (3); an interrupter (4); a condenser (5); and an oscillator (6, 7, 8). When the key (3) is closed, the current from the battery flows through the primary winding of the coil and magnetizes the iron core. The electric energy of the circuit is thus converted into

FIG. 7




magnetic force, which flows through the length of the core and the surrounding space in closed curved lines so that they intersect every turn of wire on the secondary coil. The instant this takes place the magnetic energy is changed back into current electricity, with its pressure greatly increased, for there are many more turns on the secondary than on the primary coil. For instance, assuming there are 10 turns of wire on the primary and 1000 turns on the secondary, then the increase in the potential would be 100 times that of the primary, while the current or quantity of electricity is, of course, proportionately less. Hence, at the opposite terminals of the secondary coil there will be high-pressure charges of negative and positive electricity respectively. If the ends of the secondary coil are connected to the arms of an oscillator (6, 7, 8) made of two plates of metal *aa*, and supported by the metal rods *bb*, which end in the brass balls *cc*, the space between them forming the spark-gap, the complementary arms will be charged with the high tension energy, and if the spark-gap is small enough the opposite charges will rush together, when a spark or discharge results, which, as we have seen, sets up in the open-circuit system (6, 7, 8) oscillations of high potential and high pressure frequency. At this instant the armature of the interrupter (4) is attracted by the magnetized core, the primary current is broken, when, in accordance with the laws of mutual induction, a second current is set up in the secondary coil in the opposite direction, and the sequence of charging, discharging and oscillation is repeated. The armature of the interrupter, now free, springs back to its normal position, when the circuit is again made, and the cycle of operations is again completed. As several hundred interruptions take place per minute, to all appearances the discharge through the spark-gap is continuous, although in reality there is a long period of time between the principal sparks.

The receiver of Branly consisted of an open-circuit resonator (Fig. 4), with a coherer (1) connected in between the opposite metal plates *aa*; the latter were employed by Hertz and Branly simply to increase the capacity of the circuits so that a slower period of oscillation and a longer wave would be produced. Wires were connected to opposite sides of the coherer and led to a dry cell (2) and a galvanometer (3), forming what is termed a local or internal circuit. When the oscillations caused the filings to cohere the resistance of the local circuit was reduced and the galvanometer indicated the drop by a deflection of its needle. To restore the normally high resistance of the coherer it was necessary only to tap the tube gently with a pencil, when it was ready to receive the next impulse.

*Practical.*—The apparatus just described is suitable for signalling over short distances, for laboratory or lecture purposes; but for long distance transmission the oscillator must be formed by connecting one side of the spark-gap to the grounded wire and the opposite side to the aërial wire, as shown in Fig. 8, *A*, these wires taking the place of the plates of metal in the apparatus of Hertz. The process which goes on when the instrument is in action is exactly the same as in the experimental apparatus previously noted, but owing to the height of the aërial and the number of wires of which it is formed, the waves emitted are very long, and, if the system is supplied with a requisite amount of energy, the waves are very powerful and penetrating.

A simple grounded open-circuit receptor is shown in Fig. 8, *B*. In this arrangement

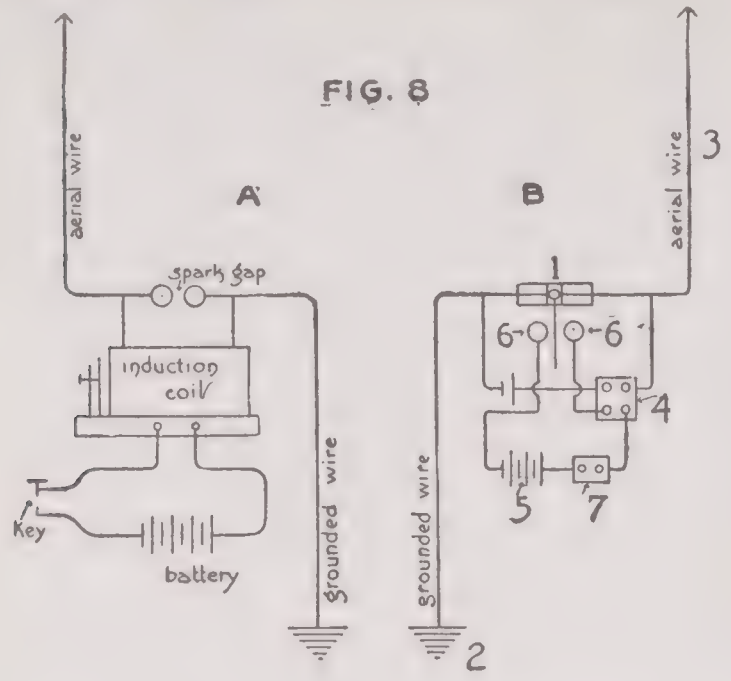



FIG. 8

one side of the coherer (1) is connected to the ground terminal (2), and the other and opposite side to the elevated wire, or aërial (3). In order to make it operate as a telegraph instrument, a local circuit connects the coherer with one side of a polarized relay (4); the relay is very sensitive to feeble electric currents, and its object is to close a second circuit which throws in a more powerful battery (5), this in turn operating a tapper (6) and a Morse register (7).

The tapper (6) is an electro-mechanical device made like a vibrating electric bell; it is arranged so that the hammer will tap the coherer-tube, thus decohering the filings automatically, when it will be ready to respond to the next impulse. A Morse register (7) is used, so that the dots and dashes of the incoming messages will be printed on a moving band of paper or tape. In some recent systems of wireless telegraphy autocoherers that restore themselves automatically are employed in connection with a dry cell and a telephone receiver, the message being read by the clicks of the diaphragm. The transmitter and receiver described are open-circuit systems, and are not tuned. Recent advances in the art demand that the sending and receiving apparatus be not only tuned to their own periods of oscillation, but syntonized, or tuned to each other. To Sir Oliver Lodge is due the credit of having been the first to devise ways and means for obtaining these results.

A type of compound open- and closed-circuit systems is shown in Fig. 9. By referring to *A* it will be seen that the transmitter comprises an induction coil, the secondary of which is shown at (1), a spark-gap (2), a pair of condensers (3, 3), and the primary of a high-tension transformer (4); the secondary of the transformer (5) connects with the aërial (6) and the ground (7). A compound resonator receiver (shown in Fig. 9, *B*) illustrates a somewhat compli-

Wireless Telegraphy

cated system of inductively associated oscillator circuits.

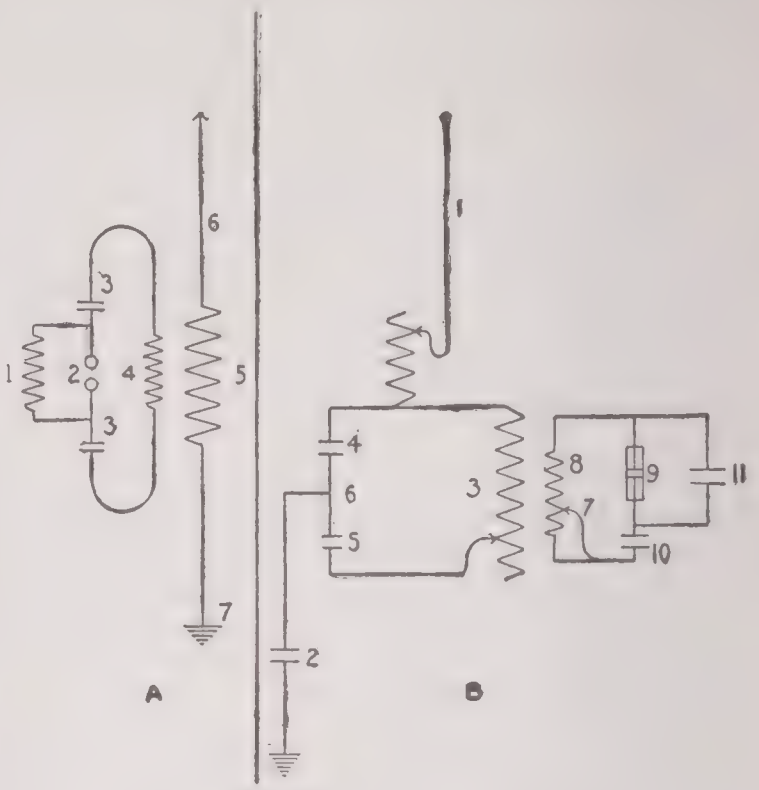
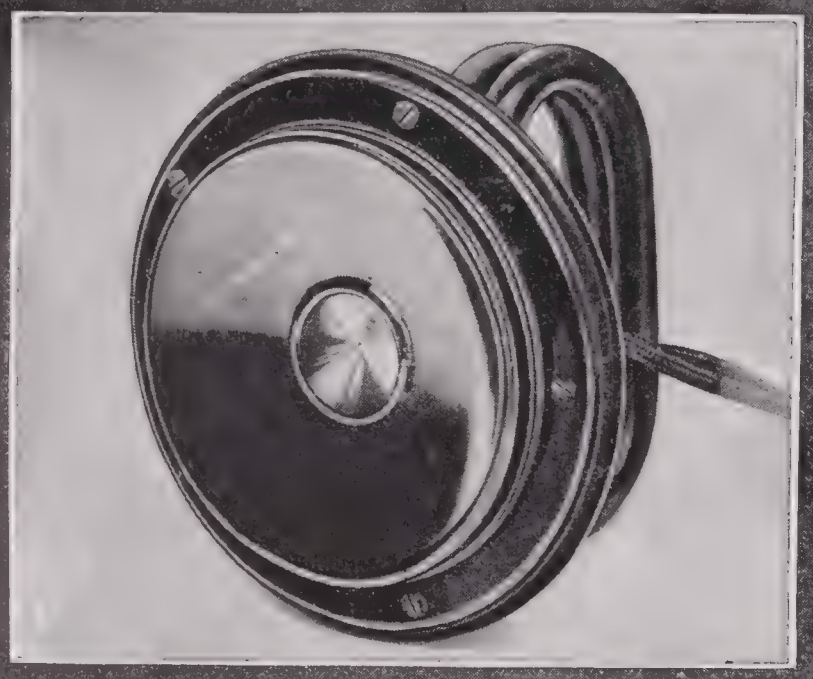
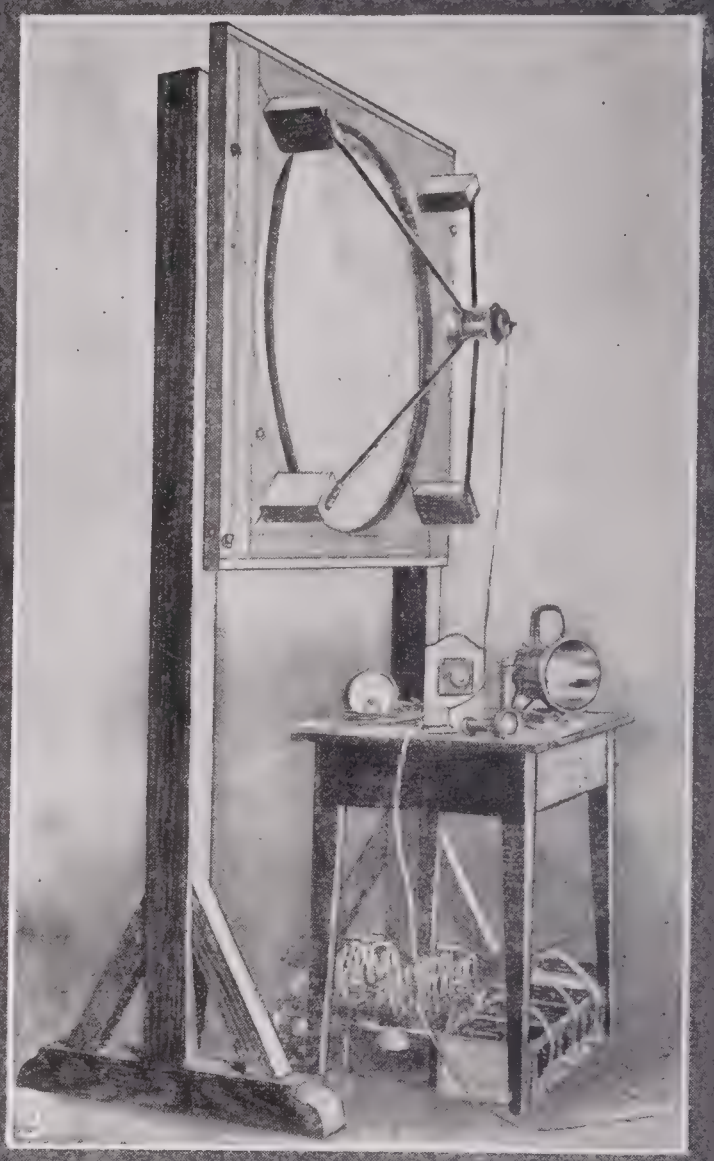


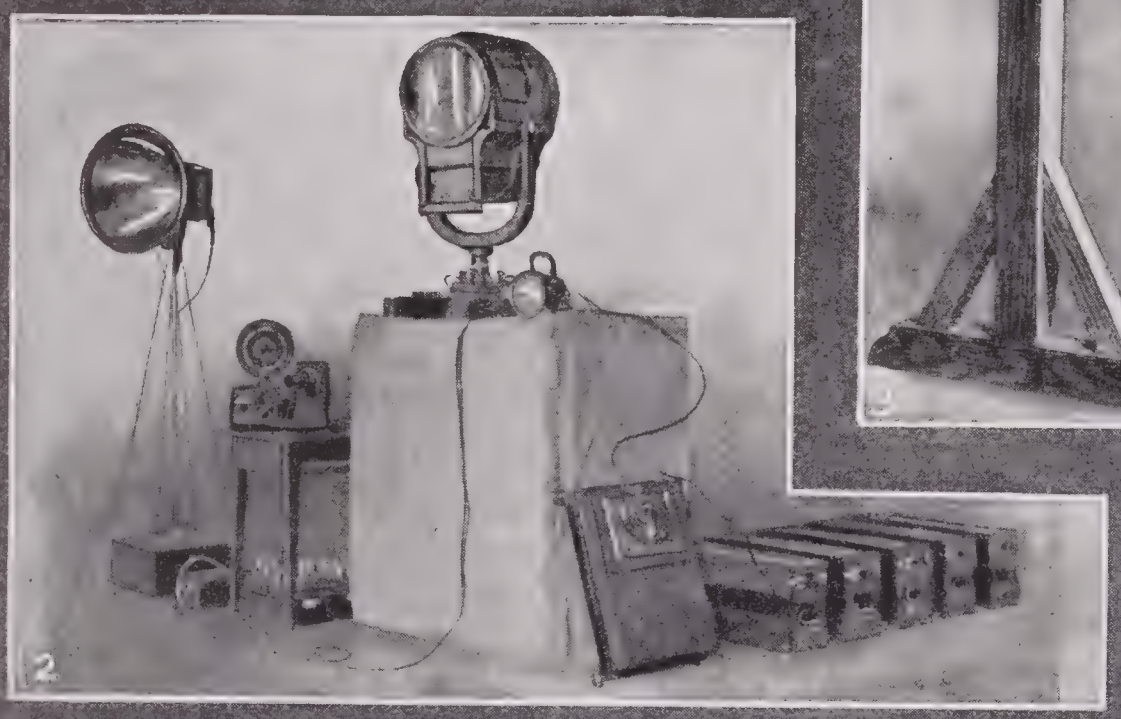

FIG. 9

In this design the antenna or aërial wire (1) is tuned by an adjustable condenser (2), and an inductance coil (3) which also acts as the primary of an oscillation transformer, and a closed circuit is formed through the condensers of fixed value (4 and 5). The secondary winding (8) of the transformer is made adjustable through the movable contact (7). There are also the coherer (shown at 9), the condenser (10) which serves to tune the circuits, and the condenser (11), the capacity of which is much greater than that of the coherer, so that the fluctuations of capacity value of the latter do not interfere with tuning the circuit in which it is placed, and also forms a closed circuit.

It is possible to syntonize two wireless stations, so that the messages sent out from one may be received only by another "tuned" to the same frequency of oscillation, or to the same condition as regards capacity, etc. Such an arrangement is useful where secrecy is required, as between the various ships of a battle fleet. In ordinary service, however, as on merchant ships at sea, selective systems are generally useless. For this reason, some means must be devised to prevent confusion of messages coming from various sources, and to enable perfect selection. The most familiar form of device for this purpose is the Marconi magnetic detector, which is used on non-selective installations without a coherer. Briefly, this apparatus includes two large pulleys driven by clockwork, and connected by a belt composed of strands of thin iron wire. On a section of its length, midway between the pulleys one side of the belt passes through a glass tube, around which is wound a coil of insulated wire. The terminals of this coil







1. Collins Telephone—Receiver.
2. Ruhmer Photo-Electric Telephone—Transmitter.
3. Ruhmer Photo-Electric Telephone—Receiver.
4. Collins Telephone.

are connected to aerial and ground, respectively. A second coil with many more turns is wound around the first near the middle, and its terminals are connected to the coil of a telephone receiver. Two permanent magnets close to the iron wire band keep it constantly in a magnetic field, whose intensity is modified by the oscillations entering the first coil, thus inducing a current on the second. The result is that all signals coming to the receiving station may be distinguished by their relative loudness, pitch, etc. Thus the operator can keep his attention focused on the desired message to the exclusion of all others. De Forest and other inventors have produced different apparatus for achieving similar results.

A. Frederick Collins.

**Wireless Telephony.** The transmission of articulate speech without wires by electricity may be accomplished by any one of four methods, namely, by conduction, by induction, photo-electrically and electromagnetically. In the *conduction method*, a direct or alternating current of low potential is projected into the earth, where its energy is propagated to considerable distances, when it may be picked up and translated by means of suitable receiving devices. The apparatus and arrangement of circuits for this mode of wireless telephony is exceedingly simple, the transmitter consisting of a speaking telephone connected in series with a battery or other source of electromotive force, the terminals leading to metal plates buried in the earth if the tests are to take place overland, or immersed in water if river or sea is used. The receptor consists of merely a telephone receiver connected with similar earthed plates, and assuming that the distance to which speech is to be transmitted is a mile, then the individual plates of the sender and the receiver should be separated by one-fourth of a mile. The principle of its operation is based upon the fact that the earth is a fairly good conductor in virtue of its great cross-section; and since it forms a portion of the circuit of the transmitter, the energy is dispersed in innumerable lines traveling in all directions, and when these curved stream-lines of force impinge upon the distant earthed receiving plates, they find a conductor of less resistance than that of the earth, and following the metallic circuit they affect the telephone receiver just as they do in a wire system. By referring to Fig. 1, showing the arrangement of the apparatus, the disposition of the plates may be seen, while the dotted lines represent the propagation of energy between them.

In the wireless transmission of speech by *induction*, two coils of wire are oppositely disposed in the same plane as indicated in Fig. 2; in the first coil a telephone transmitter and a battery for energizing the circuit are connected in series, and in the



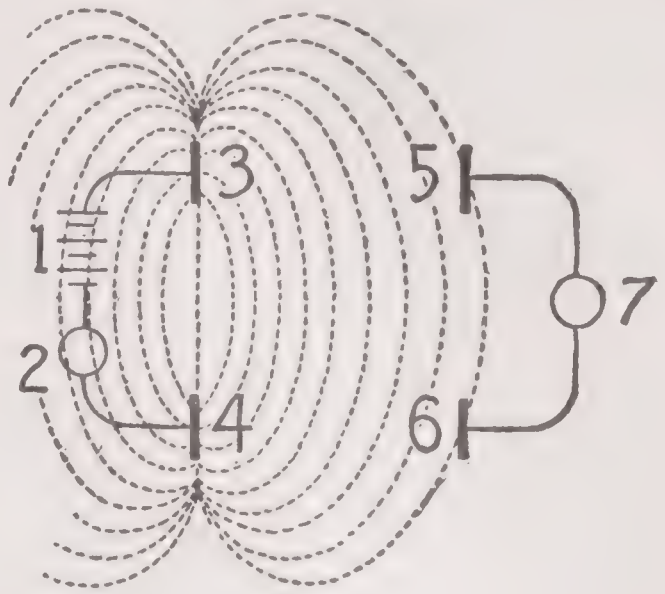



FIG. 1

second or receiving coil a telephone receiver is inserted. When spoken into, the transmitter, as before, sets up an undulatory current, which, through the inductive action of the turns of wire forming the coil, is converted into a magnetic field, the flux surrounding the coil of wire at right angles

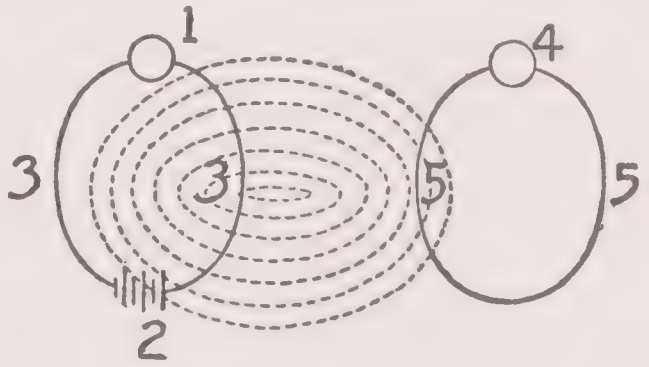



FIG. 2

in ever-expanding closed loops or circles. These lines of force pass through the air and intersect the second coil of wire, when they are changed back again into electric currents, and are made audible by the telephone receiver.

The *photophone* is an apparatus designed by Alexander Graham Bell for telephoning on a beam of light. In this device the telephone transmitter is merely a mechanical device, and the only part of the apparatus that is electrical is the receiver. To the diaphragm of the transmitter (see Fig. 3) a small concave mirror is attached for the purpose of reflecting the light through the intervening space to the receiver. The latter comprises a selenium cell fixed in the focus of a large parabolic mirror; the wires from the selenium cell lead through the back of the mirror, where they are connected with a dry battery and a telephone receiver. When in operation the light from the sun or an electric arc is focussed, by means of a plane mirror and a lens, on the mirror of the dia-

phragm, whence it is projected toward the receiver, where its diffused rays are gathered

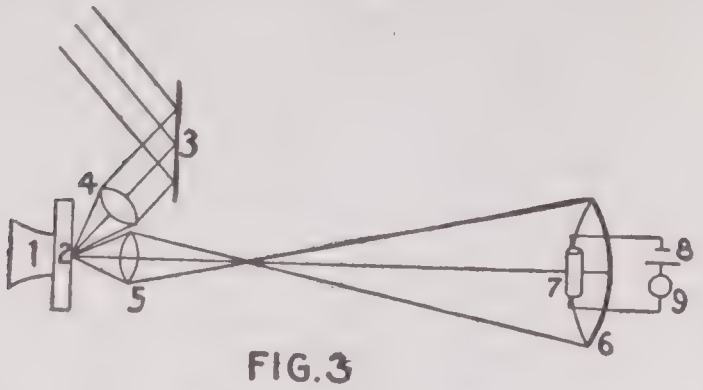



FIG. 3

into the large receiving mirror and concentrated on the selenium cell. The speaker's voice causes the diaphragm, with its concave mirror, to vibrate, and this varies the amount of light that is reflected to the receiving instrument. The light when it falls on the selenium cell reduces to a greater or less extent its resistance, and therefore the value of the current in the receiving circuit; and since these variations are exactly in phase with those of the beam of light, the words spoken into the transmitter will be reproduced by the receiver. Herr Ernst Ruhmer has recently been enabled to send and receive speech over a beam of light for several miles by a superior modification of the above method. In his photo-electric telephone, the transmitter as well as the receiver is electrical. The former comprises an arc-light placed in the focus of a parabolic mirror of large dimensions; the arc-light is supplied by a direct current from a battery or a dynamo. In a shunted circuit a telephone transmitter of the standard type is included, and a battery supplying it with an independent current. When spoken into, the transmitter varies the current strength of the battery, and this undulatory current is superimposed on the heavy direct current supplying the arc light. These differences in the volume and intensity of the light are imperceptible to the sense of sight, but are nevertheless sufficiently great to change the resistance of a selenium cell. The light, taking on the form of a parallel, may be projected to long distances, for it is in reality a search-light of great power modified to meet the new demands of space telephony. The receiver used in conjunction with the speaking arc transmitter is a refinement of the one utilized in the earlier photophone.

The remarkable property of the speaking arc, or arcophone, by which articulate speech is reproduced from an arc-light when associated electrically with a telephone transmitter, was discovered by Dr. H. T. Simon of Germany in 1897. This physicist found that when a current in a circuit paralleling an arc-light was broken, the sounds were faithfully reproduced by the light. It was but another step to connect in the circuit a telephone transmitter, and have the

Wireless Telephony

arc act as a loud speaking receiver. Following these experiments, Duddell produced the whistling arc by shunting the circuit of the lamp with an inductance and capacity, and by varying the values of the latter a note of any pitch could be produced. There are several effective arrangements by which this is made possible, one of these, used in wireless telephony, is shown in the diagram, Fig. 4, and consists of a hot-wire arc-lamp operated by a direct current; shunted by an impedance coil, which is in series with the arc, is an ordinary telephone transmitter, and a condenser is shunted across the arc and coil.

The theory of the speaking arc is that the temperature varies with the current strength as well as the light; and these deviations in temperature cause the sudden expansion and contraction of the air which in turn sends out sound waves. The temperature of the carbon vapor changes almost instantly with the current, and when the latter is increased and diminished by the superimposed current, the temperature of the arc rises or falls with it, so that the amount of vapor is constantly changing. Besides its application in photo-electric telephony, the speaking arc may become

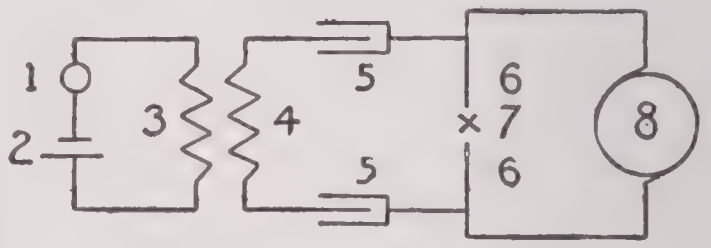



FIG. 4

commercially important as a means by which speakers can address large audiences.

Selenium, of which the cells referred to are formed, is a non-metallic element found in a red, brown or grey amorphous mass. After proper preparation it becomes a partial conductor of electricity and assumes the curious property of varying its resistance, as we have seen, under the action of light. To prepare the selenium the mass is reduced to a powder, or heated while it becomes a black, gummy substance, when it acts essentially like an insulator. In this state it is ready to be applied to the cell, which is made in different shapes and sizes, but usually is given a flat or cylindrical form. In the earliest types a gird was made by winding a pair of conducting wires forth and back on a form of glass and filling the interstices by forcing in the fused selenium between the wires. In the more recent cylindrical forms, two fine platinum wires are wound on a glass tube about one-half inch in diameter and one inch and a quarter in length, when it is coated with the prepared selenium. The next step is to bake the selenium on the cell at a high temperature for twelve hours, and

then as the temperature is gradually reduced the annealing process causes the selenium to become crystallized and of a characteristic grey color, when it acquires the property of varying its resistance when subjected to light. That the cell may remain constant under different temperatures and atmospheric conditions, it is enclosed in a sealed glass tube, a vacuum is formed by means of an air pump, and it is hermetically sealed. These cells are used not only in connection with the photo-electric telephone, but in instruments for measuring resistance, and it was once proposed to employ them in the detection of comets.

In the *electromagnetic wave method*, workers have endeavored to substitute the telephone transmitter and receiver for the key and register employed in wireless telegraphy (*q. v.*). The writer has obtained some interesting results by using closed sending and receiving currents; and in order that the oscillations might continue for a longer period of time these circuits were loaded with inductance coils and condensers. By resorting to these means the oscillations were run together so that practically a sine wave resulted, which is essential for the conversion of the speech waves into electric waves and the transformation of the latter into audible articulations. Naturally, the process tends greatly to diminish the energy emitted, and hence the effective radiation; but as the wireless telephone is not intended as a long-distance instrument, this is not so important, as will be observed when it is stated that speech is easily transmitted and received between stations at Rockland Lake, N. Y., a distance of a mile, while over three miles have been bridged when the instruments were adjusted to their maximum sensitivity. Tests were also made between the ferryboats "John S. McCullough" and "Ridgewood" plying between New York and Jersey City on the North River. The object of the wireless telephone primarily is to prevent collisions between vessels in harbors during foggy weather, and to enable the pilots to communicate between ships and shore at short range.

A. Frederick Collins.

**Wire Ropes,** ropes of iron or steel wire extensively employed in raising and lowering apparatus in coal mines, as standing rigging for ships, as substitutes for chains in suspension bridges, and for telegraph cables. Endless wire ropes or cables are also used on traction railways, and in transmitting power over long distances where ordinary belting would prove unsuitable. Birmingham is the chief seat of the manufacture in Great Britain. Wire ropes were used in 1822 for a suspension bridge at Geneva, and for a similar structure of great span at Freiburg in 1835. The earliest forms of wire ropes, known as selvagee, formed rope, and flat rope, have been almost wholly supplanted by the form known as laid rope. This is made up of six strands, each strand being composed of a certain number of wire units. The greater the number of wires in a strand, the greater the flexibility of the rope; therefore, for general use, the wire units vary from 7 per strand for a fixed rope to 19 per strand for a rope passing over a pulley. The wire units are ordinarily turned to the left and the strands to the right, but in the so-called "Lang lay" both are twisted in the same direction. Increased flexibility is also obtained by twisting the strands about a central core of hemp, and less frequently, by further twisting the wires of each strand about a similar core.

In ordinary wire ropes the wear in each strand falls especially upon that wire which is nearest to the periphery of the rope. To obviate this, ropes have been made with flattened strands, so that in each strand the wear falls upon several wires. Such strands, it has been claimed, render the rope less liable to being worn through or fractured, cause less wear in sheaves and pulleys, and do not demand so great a margin between the ultimate strength of the rope and its working load.

Other metals than iron or steel may be employed for the manufacture of wire rope, and are so employed for special uses, but the best quality of ropes for general purposes are of cast steel. The process of making is carried on throughout by machines of varying design. Wire ropes have wholly taken the place of those of fibre for several uses; and in general they may be employed for all purposes for which fibre ropes are used. They may be made quite as pliable as hemp ropes of a corresponding degree of strength, and are much more durable. The relative values of round ropes of iron, steel, and hemp are here tabulated:

| Hemp. | | Iron. | | Steel. | | Breaking Strain. |
|---|---|---|---|---|---|---|
| Circumference. | Weight per Fath. | Circumference. | Weight per Fath. | Circumference. | Weight per Fath. | |
| ins. | lbs. | ins. | lbs. | ins. | lbs. | tons. |
| 5½ | 7 | 2⅛ | 4 | 1¾ | 2½ | 8 |
| 7 | 12 | 2⅞ | 7 | 2¼ | 4½ | 14 |
| 8 | 16 | 3⅜ | 9 | 2½ | 5½ | 18 |
| 9½ | 22 | 3⅞ | 13 | 3¼ | 8 | 26 |
| 12 | 34 | 4⅝ | 20 | 3¾ | 12 | 40 |

**Wire Tapping,** a method of surreptitiously obtaining telegraphic news, by connecting wires with the telegraph lines, and

establishing an intermediate station between two authorized stations of a company. It is an indictable offense, and is committed usually in order to obtain, ahead of publication, some information that can be turned to profit by the perpetrators, as for instance the fluctuations of distant stock markets or the results of foreign or distant races — on which bets are generally taken up to the hour of publication.

**Wire Twist,** a kind of gun barrel made of a ribbon of iron and steel, coiled around a mandrel and welded. The ribbon is made by welding together laminæ of iron and steel, or two qualities of iron, and drawing the same between rollers into a ribbon.

**Wire Wheel,** a brush wheel made of wire, iron, or brass, instead of bristles, used for cleaning and scratching metals, preparatory to gilding or silvering, or matting polished metallic surfaces.

**Wireworm,** the name given by farmers and others to a kind of vermiform larvæ, long, slender, cylindrical, and somewhat rigid. Most wireworms are the larvæ of the *Elateridæ*. Some live in rotten stumps of trees, others gnaw roots of kitchen garden and other plants, cereals, grass on lawns, etc. Some of them live in the larva state for three years. One of the most common wireworms is the larva of *Cataphagus sputator*. The last segment of the body is long, entire, and wirelike. It is believed that the form of this species suggested the prefix wire in the name wireworm. It attacks the roots of lettuces, eating them as far as the collar, with the effect of killing the plant. *Agriotes lineatus* similarly devours the roots of the oat, causing the leaves to wither and the plant to die. The larva of *Hemirhipus segetis* feeds on the roots of plants with the same destructive effect. The rook, the domestic fowl, and the mole are natural foes of the wireworms. The name is sometimes applied to the *Iulidæ*.

**Wirt, William,** an American lawyer; born in Bladensburg, Md., Nov. 8, 1772; was admitted to the bar in 1792, and in 1806 settled in Richmond, Va., where he became a prominent lawyer. He distinguished himself at the trial of Aaron Burr in 1807, as one of the counsel for the prosecution. He held many State offices, being clerk of the House of Delegates, Chancellor of the Eastern Shore of Virginia, and member of the House of Delegates. He was appointed United States District Attorney in 1816, and Attorney-General in 1817, holding the latter office till 1829, through three administrations. He was nominated for President in 1832 by the Anti-Masonic party and received the electoral vote of Vermont. He wrote "Letters of the British Spy" (1803); "The Rainbow" and other essays; "Sketches of the Life and Character of Patrick Henry" (1817), and various addresses. He died in Washington, D. C., Feb. 18, 1834.

**Wisbech,** a market town of Cambridgeshire, England; in the Isle of Ely, on the Nene, 21 miles E. N. E. of Petersborough, 13 S. W. of Lynn, and 40 N. of Cambridge. The parish church, Norman to Perpendicular in style, has a fine tower; and there are a corn exchange (1811), a cattle market (1869), a town hall (1783), the Cambridgeshire hospital (1873), a museum and literary institute, and a public park of 18 acres. A castle, founded by the Conqueror in 1071, was rebuilt by Bishop Morton in 1483, restored by Bishop Andrews in 1617, and again rebuilt from Inigo Jones' designs by Thurloe, Cromwell's secretary, but was demolished in 1816. Visited by King John and Edward IV., it was the prison under Elizabeth of many Catholic recusants, including Bishops Wishart and Watson, the Jesuit Weston, Dr. Bagshaw, Catesby, and Tresham. Godwin was a native, and Clarkson, to whose memory a Gothic cross by Sir G. G. Scott was erected in 1881. Vessels of nearly 500 tons can ascend the Nene from the Wash, a distance of 7 miles; and Wisbech has a considerable export of cereals and import of timber, with some manufactures of iron, oil, ropes, etc. It was made a municipal borough in Edward VI.'s reign.

**Wisby,** the chief town of the Swedish island of Gotland; is a thriving seaport on the W. coast, and has a fine cathedral (1200). It was once one of the richest of the Hanse towns, with 18 churches, but was taken and destroyed by the Danish King Valdemar III. in 1361, and has never regained its importance. There are great ruins of seven of its former churches; but of the others and of the castle of Wisborg, destroyed by the Danes in 1675, there is little trace left.

**Wisconsin,** a State in the North Central Division of the North American Union; bounded by Lakes Michigan and Superior, Michigan, Illinois, Iowa, and Minnesota; admitted to the Union, May 29, 1848; capital, Madison; number of counties, 71; area, 54,450 square miles; pop. (1890) 1,686,880; (1900) 2,069,042; (1910) 2,333,860.

*Topography.*— Wisconsin is an elevated undulating plain with an altitude of from 600 to 1,800 feet above the sea. A ridge about 30 miles S. of Lake Superior forms the watershed of the State, the ground sloping down in all directions. A high cliff extends along the shore of Green Bay and Lake Winnebago. The Mississippi river extends along the W. boundary for a distance of 250 miles, and receives the St. Croix, Chippewa, Black, and Wisconsin rivers. Other important rivers are the Rock, St. Louis, Bois Brute, Bad, and Montreal, flowing into Lake Superior; the Menomo-

WISCONSIN
SCALE OF MILES
0 10 20 30 40 50 60
State Capital
County Seats
LAKE SUPERIOR
602 feet above mean sea level
Apostle Islands
Ashland Bay
Keweenaw Bay
Huron Bay
MICHIGAN
MINNESOTA
DOUGLAS
BAYFIELD
ASHLAND
IRON
VILAS
FLORENCE
FOREST
MARINETTE
OCONTO
LANGLADE
LINCOLN
ONEIDA
PRICE
TAYLOR
SAWYER
WASHBURN
BURNETT
POLK
BARRON
RUSK
CHIPPEWA
ST. CROIX
GREEN BAY
Duluth
Superior
Ashland
Marquette
Menominee
Marinette
Wausau
Rhinelander
Antigo
Merrill
Hayward
Chippewa Falls
St. Paul
Menominee Indian Reservation
Lac Courte d'Orielles Ind. Res.

Hammond's 8 x 11 Map of Wisconsin

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Wisconsin

nee, Peshtigo, Oconto, Pensaukee, and Fox, flowing into Green Bay; and the Manitowoc, Sheboygan, and Milwaukee, emptying into Lake Michigan. The State is famous for its numerous beautiful lakes, among which are the Winnebago, St. Croix, Pepin, Poygan, Pewaukee, Geneva, Green, Koshkonong, Oconomowoc, and Four Lakes. The lake shores have numerous excellent harbors, including Green Bay, Chequamegon Bay, and Port Washington.

*Geology and Mineralogy.*—The Laurentian, Devonian, and Archæan periods are all well represented in Wisconsin. The Archæan rocks cover an area in the N. central portion of the State, with an extreme length of 240 miles, and 160 miles wide. They consist principally of metamorphic granite, gneiss, syenite, diorite, schists, and slates. S. of this tract, and along the Lake Superior slope are beds of Silurian origin. The mineral resources of the State are very extensive. Lead, copper, iron, and zinc occur abundantly and are mined with profit. The principal mineral productions in 1900 included red hematite, 733,212 long tons; brown hematite, 12,793 long tons; granite valued at $407,711; sandstone, $81,751; limestone, $989,685; clay products, $1,811,712; coke, 48,000 short tons, valued at $240,000; and mineral water, 9,581,061 gallons, valued at $1,261,312.

*Agriculture.*—Much of the N. part of the State is covered with extensive forests of white pine, balsam, hemlock, and other cone-bearing evergreens. The soil in the N. is not well adapted to agriculture, but the prairies in the S. and central portions are exceedingly rich and productive, raising the cereals, tobacco, and potatoes in great quantities. The principal farm crops in 1900 were corn, 49,547,240 bushels, valued at $16,350,589; wheat, 13,166,599 bushels, valued at $8,426,623; oats, 61,971,552 bushels, valued at $14,253,457; barley, 6,259,179 bushels, valued at $2,754,039; rye, 3,010,437 bushels, valued at $1,475,114; buckwheat, 385,462 bushels, valued at $227,423; potatoes, 15,619,641 bushels, valued at $4,373,499; and hay, 1,218,354 tons, valued at $11,757,116.

*Manufactures.*—According to the United States census of 1900, the State had 16,187 manufacturing establishments, employing $330,568,779 capital and 152,836 persons; paying $69,015,980 for wages and $208,838,167 for materials; and having an aggregate output valued at $360,818,942. The principal manufactures, according to the values of output, were: lumber and timber ($57,634,816); flour and grist ($26,327,942); foundry and machine shop products ($22,252,730); railroad cars ($20,120,147); leather ($20,074,373); malt liquors ($19,394,709); packed meat ($13,601,125); and paper and wood pulp ($10,895,576).

*Banking.*—On Oct. 31, 1901, there were reported 96 National banks in operation, having $10,573,710 in capital; $5,009,180 in outstanding circulation; and $4,284,620 in United States bonds. There were also 151 State banks with $6,824,725 capital, and $1,131,559 surplus; 138 private banks, with $1,154,322 capital; and 1 mutual savings bank, with $634,236 in savings deposits. The exchanges at the United States clearing house at Milwaukee, during the year ending Sept. 30, 1901, aggregated $315,787,647, an increase over those of the preceding year of $17,763,054.

*Education.*—At the end of the school year 1899-1900 the children of school age numbered 618,290; the enrollment in public schools, 445,142; the average daily attendance, 309,800. There were 7,242 public school buildings, public school property valued at $17,630,000, and 13,063 teachers. For higher education there were 183 public high schools, 25 private secondary schools, 7 public and 2 private normal schools, 10 universities and colleges for men and for both sexes, and the Milwaukee Downer College for Women, at Milwaukee. The principal colleges include the University of Wisconsin, at Madison; Beloit College, at Beloit; Marquette College and Concordia College, at Milwaukee; and Lawrence University, at Appleton.

*Churches.*—The strongest denominations in the State are the Roman Catholic; Lutheran, Independent Synods; Methodist Episcopal; Congregational; Regular Baptist; Evangelical Association, German Evangelical Synod; and Presbyterian. In 1899 there were reported 6,768 Evangelical Sunday-schools, with 22,880 officers and teachers, and 447,497 scholars.

*Postoffices and Periodicals.*—On Jan. 1, 1901, there were 1,942 postoffices of all grades, and 657 periodicals, of which 64 were daily, 12 semi-weekly, 520 weekly, 2 bi-weekly, 2 semi-monthly, 52 monthly, 1 bi-monthly, and 4 quarterly.

*Railroads.*—The total length of railroads within the State, Jan. 1, 1901, was 6,566 miles, of which 86 miles were constructed during the previous year.

*Finances.*—In 1902 the State had no indebtedness except the following trust funds: School fund, $1,563,700; Normal school fund, $515,700; University fund, $111,000; Agricultural College fund, $60,600; total, $2,251,000. The assessed valuation in 1900 was, real estate, $503,690,767; personal property, $126,309,233; total, $630,000,000; State tax rate, $2.136, per $1,000; and total taxes raised, $1,345,570.

*State Government.*—The governor is elected for a term of two years, and receives a salary of $5,000 per annum. Legislative sessions are held biennially in odd years, beginning on the second Wednesday in January, and there is no limit to length of ses-

sion. The Legislature has 33 members in the Senate and 100 in the House, each of whom receives $500 per annum and mileage. There are 11 representatives in Congress. The State government in 1902 was Republican.

*History.*— The region W. of Lake Michigan was first explored and occupied by French missionaries and traders in 1639, and the country was held thenceforward under French dominion till its surrender to Great Britain in 1763. Canadian law governed the territory, and the English kept possession with a military force at Green Bay till 1796, when it reverted to the Americans, who included it within the extended limits of their government of the Northwest Territories. In 1809 Wisconsin was annexed to the Territory of Illinois, as then formed, and so continued till the conversion of the latter into a State in 1818, when Wisconsin, which was yet a wilderness, was annexed to Michigan Territory, for such government as was needed. In 1827, lead was discovered in large quantities at Potori and Mineral Point, and there was a great rush of immigrants to that section. The Indians soon became troublesome, and the Black Hawk War ensued in 1832. Treaties were made with the Indians soon after, by which they removed to reservations beyond the Mississippi. In 1836, the population had increased to such an extent that a Territorial government was organized, which at first included a part of the upper peninsula of Michigan, the whole of Minnesota and Iowa, and that part of the Dakotas lying E. of the Missouri and White Earth rivers. On the admission of Michigan into the Union as a State, a part of the Lake Superior region was set off to her, and when the Territory of Iowa was formed, it included all the region W. of the Mississippi. The first effort to procure the admission of Wisconsin to the Union as a State was made in 1846. A constitution drafted during that year was ratified in March, 1848, and the State was admitted to the Union by Act of Congress, May 29, 1848. Under this constitution, with some amendments, it is still governed.

**Wisconsin River,** the largest river in Wisconsin. It rises in Lake Vieux Desert, in the N. part of the State, and flows S. and W., emptying into the Mississippi 4 miles below Prairie Du Chien. It is nearly 600 miles long and is navigable to Portage City. Remarkable rapids and falls, called "dalles," occur at several places, the river passing through deep gorges between rocky bluffs, some of which are more than 400 feet high.

**Wisconsin, The,** a battleship of the United States navy, in all material respects identical with the "ALABAMA" and the "ILLINOIS" (*q. v.*). She was built at the Union Iron Works, San Francisco, Cal., and was launched Nov. 26, 1898.

**Wisconsin, University of,** a coeducational non-sectarian institution in Madison, Wis.; chartered in 1838; opened in 1850; has grounds and buildings valued at over $3,800,000; productive funds, $675,000; volumes in the library, 135,000; average faculty, 395; average students, including summer school, 5,150; graduates, over 7,200.

**Wisdom,** the quality or state of being wise; the power or faculty of seeing into the heart of things and of forming the fittest and best judgment in any matter presented for consideration; knowledge and the capacity to make due use of it; knowledge of or the capacity to discern the best ends and the best means; a combination of discernment, judgment, sagacity, or similar powers with knowledge, especially that knowledge which is gained from experience. (It is often nearly synonymous with discretion, sagacity, or prudence, and frequently it implies little more than sound commonsense, perfect soundness of mind or intellect, and hence is often opposed to folly.)

**Wisdom of Solomon, The,** the title of an apocryphal book, named in Greek *Sophia Salomon,* or *Salomontos,* generally placed sixth in order between "the rest of Esther" and Ecclesiasticus. Its author professes that he is a king (vii: 1–6; ix: 7), and son of a worthy father, also a king (12). He himself prayed to God for wisdom and received it, wealth being superadded (vii:7–13). God directed him to build a temple on the holy mount on the model of the tabernacle (ix: 8), from all which it is obvious that the author claims to be Solomon, the son of David, King of Israel. The book is now divided into 19 chapters. The first of these exhorts judges to love righteousness, and commends wisdom to them and others. The second denounces the unbelief of the ungodly, and traces to this source the wickedness of their lives. The third, fourth, and fifth point out that for the righteous there is a happy future, while an opposite destiny awaits the wicked. Chapters vi.–ix. highly commend wisdom. Portions of them resemble corresponding exhortations and descriptions in the Books of Proverbs (Wisd. vi: 12–15, and Prov. viii: 17–21; ix: 9 and Prov. viii: 25–30). The advantages of wisdom are shown in chapters x.–xii. by illustrations taken from the history recorded in the Pentateuch. In chapters xiii.–xv. the folly of idolatry is exhibited in language of great beauty and force, and a philosophic explanation of its origin is attempted. (Wisd. xiii: 11–16 and Isaiah xliv: 12–20). The last four chapters contrast the providence which watches over the wise and the pious with the judgments which overtake idolaters and the ungodly, historical illus-

trations, as before, being derived solely from the Mosaic writings. Though the book is called "The Wisdom of Solomon," there is no reason to believe that he was its author. It was composed originally in Greek, probably by some Jew resident in Alexandria. It incorporates words from the Septuagint version of Isaiah iii: 10, xliv: 20 (about 284–246 B. C.), and therefore was subsequent to that date. The Apostle Paul was evidently acquainted with this book (Wisd. xiv: 21–27 and Rom. i: 19–32; Wisd. xv: 7 and Rom. ix: 21; Wisd. ix: 15 and I Cor. xv: 53, II Cor. v: 1; Wisd. v: 17–20 and Ephes. vi: 11–17). It is not influenced by Philo, 20 B. C. to A. D. 40 (?) and in all likelihood was earlier than his era. Its more probable date was 150 to 50 B. C., or more approximately 120 to 80 B. C. If these dates are nearly correct, then Wisdom is the most ancient Jewish book except Daniel (xii: 2, 3), in which the doctrine of rewards and punishments in a future state is clearly set forth; but it differs from Daniel in teaching the immortality of the soul, without reference to the resurrection of the body. It is the first book which identifies the serpent which tempted Eve with the Devil (Wisd. ii: 24 and Gen. iii: 1–5, 14, John viii: 44, and Rev. xii: 9, xx: 10). No one can study the Book of Wisdom without entertaining high respect for its author, and deriving profit from his ethical teachings. For thoughtful and beautiful sentiments see i: 4, 6; iv: 8, 9; vi: 18; xvii; 11, 12, etc.

**Wisdom Tooth,** the popular name for the third molar in each jaw. They appear between the ages of 17 and 25, when a person may be presumed to have attained some degree of experience or wisdom.

**Wise, Daniel,** an American clergyman; born in Portsmouth, England, Jan. 10, 1813; came to the United States in 1832. He was editor of "Zion's Herald" at Boston, Mass., and various Sunday-school publications, and published a great number of works on varied subjects, mostly under the pen-names of "Francis Forrester" and "Laurence Lancewood." Among these are: "Personal Effort" (1841); "Life of Ulric Zwingli" (1850); "My Uncle Toby's Library" (12 vols. 1853); "Vanquished Victors" (1876); "Heroic Methodists" (1882); "Boy Travelers in Arabia" (1885); "Men of Renown" (1886); and "Some Remarkable Women" (1887). He died Dec. 19, 1898.

**Wise, Henry Alexander,** an American statesman; born in Drummondtown, Va., Dec. 3, 1806; was educated at Washington College, Pa.; admitted to the bar in 1828; member of Congress in 1833–1843; minister to Brazil, under President Tyler, in 1844–1847; and Democratic governor of Virginia in 1856–1860. He opposed secession, but in 1861 joined the Confederate army as Brigadier-General. He was defeated in the Kanawha valley in 1861, and at Roanoke Island in 1862. After the war he resumed the practice of law in Richmond, Va., and died there Sept. 12, 1876.

**Wise, Henry Augustus,** an American naval officer; born in Brooklyn, N. Y., May 12, 1819; entered the navy as midshipman in 1834, and rose to chief of the bureau of ordnance in 1866. Under the pseudonym of "Harry Gringo," he wrote "Los Gringos; or, An Interior View of Mexico and California, with Wanderings in Peru, Chili, and Polynesia" (1849); "Tales for the Marines" (1855); "Scampavias, from Gibel-Tasek to Stamboul" (1857); "The Story of the Gray African Parrot" (1856), a book for children; and "Captain Brand of the Centipede" (1860). He died in Naples, Italy, April 2, 1869.

**Wise, Isaac Mayer,** a Jewish rabbi; born in Bohemia, April 3, 1819; settled in New York city in 1846. He resided in Cincinnati, O., after 1854, and became president of the Hebrew Union College. He was a leader of the reform movement in American Judaism; and besides editing the "Israelite," a weekly journal, he wrote extensively. Among his works are: "History of the Israelitish Nation" (1854); "Essence of Judaism" (1860); "Judaism: Its Doctrines and Duties" (1862); "The Martyrdom of Jesus of Nazareth" (1874); "The Cosmic God" (1876); "History of the Hebrews' Second Commonwealth" (1880); "Judaism and Christianity" (1883); "Pronaos to Holy Writ" (1891); etc. Died March 26, 1900.

**Wise, Peter Manuel,** an American alienist; born in Clarence, N. Y., March 7, 1851; was graduated at the Medical Department of the University of Buffalo in 1872; appointed a commissioner to locate and plan the State Insane Asylum for Northern New York in 1882; became president of the New York State Commission on Lunacy, Oct. 1, 1896; and was Professor of Psychiatry at the University of Vermont in 1891–1895. He was the author of "Text-Book for Training Schools" (2 vols. 1896); "Notes on Asylums of Great Britain" (1882); "Sexual Perversion" (1883); "Examination of the Insane" (1883); and "Recovery of the Chronic Insane." He died in 1907.

**Wiseman, Nicholas Patrick,** an English prelate; born in Seville, Spain, Aug. 3, 1802; was educated at Waterford and the Roman Catholic College, Ushaw, near Durham; joined the English College then newly formed (1818) at Rome; became Professor of Oriental Languages and (1828) rector of the English College; returned to England (1835), and was appointed successively rector of Ushaw, vicar apostolic of the central district of England, and Roman Catholic Archbishop of Westminster and

cardinal (1850). He was the author of "Lectures on the Connection between Science and Revealed Religion" (1836), "Letters on Catholic Unity" (1842); "Papal Supremacy" (1850); "Fabiola" (1854); "Four Last Popes" (1858); and joint-editor for many years of the Dublin "Review." He died in London, England, Feb. 15, 1865.

**Wise Men of the East,** the three Magi who followed the guiding star to Bethlehem. They are the patron saints of travelers.

**Wiserine,** or **Wiserite** (after Herr Wiser, of Zurich). (1) A name given by Kenngott to a mineral occurring in small square prisms with square pyramids implanted on crystals of iron glance ("eisenrose"). The same as xenotime. (2) A mineral occurring in somewhat complex crystal-forms sent to Klein under this name was found to be anatase. Found implanted on the sides of fissures of the schists of the Binnenthal, Wallis, Switzerland.

**Wishing,** in anthropology, connected with or bestowed by wish; bestowing the best that the heart can wish. The expression is borrowed from Scandinavian and Teutonic mythology, though the idea is found in the folk tales of many other races. Grimm identifies the wishing purse of Fortunatus, which was never empty, with the cornucopia; his wishing cap, which transported him from place to place, with the petasus of Hermes; and in the wishing rod, credited with the power of enabling its owner to discover and obtain gold or other treasure buried in the earth, he sees a reference to the Caduceus.

**Wisner, George Y.,** an American civil engineer; born in West Dresden, N. Y., July 11, 1841; was graduated at the University of Michigan; served in the government survey on the Mississippi river and on the Great Lakes in 1865–1880, and on surveys of the Mississippi, Illinois, and Des Plaines rivers in 1880–1884. He was next superintendent of the 10th and 11th United States Lighthouse districts. In 1887 he established a private practise. His publications include: "Geodetic Field Work" (1883); "Brazos River Harbor Improvement" (1891); "Breakwaters, Sea Walls and Jetties" (1893); "Hydraulics of Rivers Having Alluvial Beds" (1896); "Sewage Disposal"; "Report of Deep Waterway Commission"; "Canals from the Great Lakes to the Atlantic"; etc. He died in 1906.

**Wismar,** the second seaport of Mecklenburg-Schwerin, Germany; on the Baltic, at the head of a bay of the same name; 20 miles N. of Schwerin. It has an excellent harbor, carries on an active over-sea trade, and has varied manufactures. Of the walls only four gates remain; but the numerous quaint old houses are a feature of the place, and several of the brick churches, as well as the Fürstenhof, once a ducal residence, date from the 14th and 15th centuries. It was a Hanse town in the 13th century, passed to Sweden in 1649, was taken by the Danes in 1675, and by the Danes, Prussians, and Hanoverians in 1712, when its strong fortifications were destroyed, and in 1803 was pawned to Mecklenburg-Schwerin, which secured it finally in 1828. Pop. (1895) 18,240; (1905) 21,902.

**Wissadula,** in botany, a genus of *Malveæ.* Involucre none; calyx five-partite; petals five; capsule five-celled; seeds reniform. Shrubs from the tropics of Asia and America. *W. rostrata* is a native of the Malay Peninsula, Java, tropical Africa and America, and is cultivated in Ceylon and India. The bark abounds in useful flaxen fibers; it also yields a good hemp.

**Wissembourg,** till 1871 a French fortified town, close to the frontier of the Bavarian palatinate; now a manufacturing town in the German district of Lower Alsace; on the Lauter, 42 miles N. N. E. of Strassburg. It grew up round a 7th-century Benedictine abbey, and in 1677–1697 was ceded to France. Here was fought, on Aug. 4, 1870, the first great battle of the Franco-German War, in which the Germans were victorious. The Lines of Wissembourg, originally made by Villars in 1706, are famous — a line of works extending to Lauterburg 9 miles S. E. Like the fortifications of the town, those of the lines have now disappeared.

**Wissmann, Hermann von,** a German African explorer; born in Frankfort on the Oder, Sept. 4, 1853. He crossed the African continent in 1880–1882; commanded an expedition sent out by Leopold II., in 1884–1885; as imperial German commissioner, suppressed the Arab revolt under Bushiri; failed in an attempt to take two steamers to Lake Victoria via Nyassa and Tanganyika in 1892; received the "Royal Crown of the Order of the Red Eagle" in 1894; became governor of German East Africa in 1895; president of the Berlin Geographical Society in 1897. He wrote: "In the Interior of Africa"; "Under the German Flag across Africa"; "My Second Crossing of Equatorial Africa"; "Africa: Descriptions and Advice"; etc. Died June 16, 1905.

**Wistar, Caspar,** an American physician; born in Philadelphia, Pa., Sept. 13, 1761; received a classical education; was graduated at the Medical Department of the University of Pennsylvania in 1782; spent several years in England and Scotland; and returning to the United States in 1787 he began practise in his native city. He was Professor of Chemistry and the Institutes of Medicine at the College of Philadelphia in 1789–1792. In the latter year that in-

stitution was united with the Medical Department of the University of Pennsylvania, and he was there Adjunct Professor of Anatomy, Midwifery, and Surgery in 1792–1808; then became Professor of Anatomy and held the chair till his death. He was the first to show that the posterior portion of the ethmoid bone was attached to the triangular bones. He opened his house once a week for meetings of students, travelers, scientists, and citizens. These symposiums were long continued after Dr. Wistar's death, being known as the Wistar parties. Dr. Wistar became a member of the American Philosophical Society in 1787, and succeeded Thomas Jefferson as president in 1815. He was the author of "A System of Anatomy, for the Use of Students of Medicine." He died in Philadelphia, Pa., Jan. 22, 1818.

**Wistar, Isaac Jones,** an American penalogist; born in Philadelphia, Pa., Nov. 14, 1827; received a collegiate education; and served in the Civil War as Brigadier-General of volunteers in 1862–1865. Subsequently he accepted the presidency of the Academy of Natural Sciences of Philadelphia; was inspector of the Eastern Penitentiary of Pennsylvania in 1892–1896; founded the Wistar Institute of Anatomy and Biology; president of the State Board of Charities of Pennsylvania; and author of works on penalogy. He died Sept. 18, 1905.

**Wistaria,** a genus of plants of the natural order *Leguminosæ,* sub-order *Papilionaceæ,* having pinnate leaves and flowers in terminal racemes, the pod leathery. The species were formerly included in the genus *Glycine.* Some of them are among the most magnificent ornamental climbers known in British gardens. *W. frutescens,* a native of Virginia, Illinois, and other parts of North America of similar climate, found chiefly in marshy grounds, attains the height of 30 feet, and has beautiful racemes of fragrant bluish-purple flowers. *W. chinensis* or *consequana,* a native of China, has larger flowers in pendulous racemes, and its branches run to the length even of 90 feet. These plants are generally trained on walls.

**Wister, Annis Lee (Furness),** an American translator; born in Philadelphia, Pa., Oct. 9, 1830; married Dr. Casper Wister (1817–1888). She made many translations of note, among them: E. Marlitt's "The Old Mamselle's Secret" (1868); "Gold Else" (1868); "The Countess Gisela" (1869); "The Little Moorland Princess" (1873), and "The Second Wife" (1874); Wilhelmine von Hillern's "Only a Girl" (1870); Hackländer's "Enchanting and Enchanted" (1871); Volkhausen's "Why Did He Not Die?" (1871); Von Auer's "It Is the Fashion" (1872); and Fanny Lewald's "Hulda; or, The Deliverer" (1874). She died Nov. 15, 1908.

**Witchcraft,** the practices of witches; a supernatural power which persons were formerly supposed to obtain by entering into a compact with the devil. The compact was sometimes express, whether oral or written, when the witch abjured God and Christ, and dedicated herself wholly to the evil one; or only implied, when she actually engaged in his service, practised infernal arts, and renounced the sacraments of the Church. The express compact was sometimes solemnly confirmed at a general meeting, at which the devil presided, and sometimes privately made by the witch signing the articles of agreement with her own blood, or by the devil writing her name in his "black book." The contract was sometimes of indefinite duration, at other times for a certain number of years. The witch was bound to be obedient to the devil in everything, while the other party to the act delivered to the witch an imp, or familiar spirit, to be ready at call and to do whatever was directed. He further engaged that they should want for nothing, and be able to assume whatever shape they pleased to visit and torment their enemies and accomplish their infernal ends. The belief in witchcraft is of great antiquity. The punishment for witchcraft was death, generally by burning. The number of people put to death in England has been estimated at about 30,000. Statutes were passed against witchcraft in the reigns of Henry VI., Henry VII. (1541), Elizabeth (1563), and James I. (1604). During the sitting of the Long Parliament 3,000 persons are said to have been executed on the charge of witchcraft. Judicial convictions were checked chiefly by the firmness of Judge Holt, who in about 10 trials, from 1694 to 1701, charged the juries in such a manner as to cause them to bring in verdicts of acquittal.

The first law against witchcraft in Scotland was passed in 1563. The last victims in England were Mrs. Hickes and her daughter, nine years of age, executed in 1716, and the last in Scotland suffered in 1722. Prosecution for witchcraft was abolished both in England and in Scotland by 9 George II. (1736), which made all persons pretending to use the name punishable by imprisonment. By a subsequent act passed in the reign of George IV., they were made punishable as rogues and vagabonds. Witchcraft was first practised in America in 1692 at Salem, Mass. It broke out in the family of Mr. Parish, a minister. A company of girls had been in the habit of meeting a West Indian slave to study "black art." They suddenly began to act mysteriously, bark like dogs, and scream at something unseen. An old Indian servant was accused of bewitching them. The excitement spread and impeachments multiplied. A special court was formed to try the accused, and as a result the jails rapidly filled, and many

were condemned to death. It was unsafe to express a doubt of a prisoner's guilt. Fifty-five persons suffered torture, and 20 were executed. Witches were supposed to be able, with the assistance of the devil, not only to foretell events, but to produce mice and vermin, to deprive men and animals, by touching them or merely breathing on them, of their natural powers, and to afflict them with diseases, to raise storms, etc., to change themselves into cats and other beasts, etc. General assemblies of witches, called "Witches' Sabbaths," were held yearly, or oftener, at which they appeared entirely naked, and besmeared with an ointment made from the bodies of unbaptized infants. To these meetings they were supposed to ride from great distances on broomsticks, pokers, goats, hogs, or dogs, the devil taking the chair under the form of a goat. Here they did homage to their master, and offered him sacrifices of young children, etc., and practised all sorts of license till cock-crowing. Neophytes were introduced to the devil at these meetings, and received his mark on their bodies, in token that they had sold their souls to him. See DEMONOLOGY: DEVIL.

**Witch Elm,** or **Wych Elm,** the *Ulmus montana;* a large tree 80 to 100 feet high; the trunk with an occasional girth of 50 feet; the twigs pubescent, the leaves doubly or trebly serrate, the stamens four to six with purple anthers, the seed in the center of the oblong or sub-orbicular samara. Indigenous in the N. of England and in Scotland. Called also the Scotch or mountain elm.

**Witches' Butter,** in botany: (1) The popular name for a fungus, *Exidia glandulosa;* dark brown or black, and of jelly-like consistence, with small, glandular points above and a rough surface below. (2) The genus *Tremella,* and specifically *T. nostoc.* Named from its buttery appearance and its rapid growth in the night. Called also witch meat.

**Witch-hazel.** See HAZELINE.

**Witenagemot,** or **Witenagemote,** in English history, among the Anglo-Saxons the great national or general assembly which met annually or oftener, whenever the king kept his Christmas, Easter, or Whitsuntide, as well to do private justice as to consult on public business. It was composed of the athelings, or princes, ealdormen, or nobles, the large landowners, the principal ecclesiastics, etc. They formed the highest court of judicature in the kingdom, and their concurrence was necessary to give validity to laws, and treaties with foreign states. They had even power to elect the king, and if the throne passed to the heir of the late king, the new sovereign had to be recognized formally by the witenagemot at a meeting assembled for the purpose.

**Withamite** (after Dr. Witham, who discovered it), a variety of *Epidote* of a carmine-red color; strongly pleochroic; hardness, 6–6.5; sp. gr., 3.137. found in acicular crystals in a trap rock at Glencoe, Argyleshire.

**Withania,** in botany, a genus of *Physaleæ.* Calyx campanulate, five-toothed; corolla campanulate, the limb five-partite; stamens five, inserted in the tube of the corolla, not prominent; berry enclosed in the enlarged calxy, two-celled, with several sub-reniform seeds. Small shrubs, chiefly from Spain and the Canary Islands. *W. coagulans,* a small Afghan and Indian shrub, produces small berries, used by the natives in coagulating milk to make it into cheese. The dried fruit, which is alterative and diuretic, is given in India, in dyspepsia, flatulent colic, and chronic liver diseases. The root of *W. somnifera,* another Indian species, is considered to be tonic, alterative and aphrodisiac, narcotic and diuretic, and deobstruent; it is given in India in consumption, debility, and marasmus; the leaves, which are very bitter, are prescribed in fevers, and the fruit as a diuretic; the ground root and leaves are used as an external application in carbuncles, ulcers, and painful swellings.

**Wither, George,** an English poet; born in Brentworth, Hampshire, England, June 11, 1588. A satire, "Abuses Stript and Whipt," which he published in 1613, led to his imprisonment in the Marshalsea; but his "Satire to the King," supported, it would appear, by the friendship of the Earl of Pembroke, secured his release in the following year, and in 1622–1623 he obtained the king's patent for his "Hymns and Songs of the Church." In 1632 he was in the Netherlands, and in 1639 he served as captain of horse in the expedition of Charles I. into Scotland. Three years later he raised a troop of horse for the Parliament; was taken prisoner by the royalists; but was soon released. From the Parliament he afterward received numerous favors, culminating in the mastership of the state office in 1655 and 1656; but on the Restoration his property was confiscated, and he was once more cast into prison. Released in July, 1663, he only survived till May 2, 1667. Wither is one of the most voluminous of poets; upward of 100 separate publications are enumerated by his bibliographer. Among his more important productions are "The Shepheard's Hunting" (1615), a pastoral; "Britain's Remembrancer" (1627); "A Collection of Emblemes" (1635); and "Hallelujah, or Britain's Second Remembrancer" (1643).

**Witheringia** (named after Dr. William Withering, 1741–1799, author of a "Botanical Arrangement of the Vegetables of Great Britain, 1776), in botany, a genus of *Solaneæ*. Calyx urceolate-campanulate, four to five cleft; corolla rotate, the tube short, the limb four or five cleft; stamens four or five; berry two-celled, many-seeded. Trees, shrubs, or herbs, mostly South American, though one species is from the Cape of Good Hope. About 20 are known. They are not very handsome, and have not been introduced into greenhouses. The Peruvian Indians are said to boil the roots of *W. montana* as an ingredient in soup.

**Witherite** (after Dr. Withering), a mineral extensively mined near Hexham, Northumberland, England, occurring in many other localities, but mostly in small quantities; crystallization, orthorhombic, but mostly found massive; hardness, 3 to 3.75; sp. gr., 4.29 to 4.35; luster, vitreous; color and streak, white; sub-transparent to translucent; composition: Carbonic acid, 22.3; baryta, 77.7 = 100, which yields the formula BaOCO. Used in the manufacture of plate-glass, adulteration of white lead, and in sugar refining.

**Withernam,** in law, an unlawful distress or forbidden taking, as of a thing distrained out of the country, so that the sheriff cannot on the replevin make deliverance thereof to the party distrained. Also, the reprisal of other cattle or goods in lieu of those that have been unjustly taken, eloined, or otherwise withholden. The cattle or goods thus taken are said to be taken in withernam.

**Withe Rod,** the *Viburnum nudum*, a shrubs 8 or 10 feet high. Leaves oval-oblong, reticulated beneath, their margin revolute and obscurely crenulate; petioles naked; flowers in pale yellow cymes; berries blue. Found in swamps in North America.

**Witherspoon, John,** an American educator; born in Yester, Haddingtonshire, Scotland, Feb. 5, 1722. He became president of Princeton College in 1768; delegate for six years from New Jersey to the Continental Congress; and a signer of the Declaration of Independence. He wrote: "Ecclesiastical Characteristics" (1753); "Nature and Effects of the Stage" (1757); "Essays on Important Subjects" (1764); "Considerations on the Nature and Extent of the Legislative Authority of the British Parliament" (1774); etc. ("Works," 9 vols. Edinburgh, 1804). He died near Princeton, N. J., Sept. 15, 1794.

**Withrow, William Henry,** a Canadian clergyman; born in Toronto, Canada, Aug. 6, 1839. In 1874 he became editor of the "Methodist Magazine," Toronto. He wrote: "Catacombs of Rome" (1874); "History of Canada" (1878); "Lawrence Temple" (1881), a novel; "Valeria, the Martyr of the Catacombs" (1884); "Life in a Parsonage" (1885); "Men Worth Knowing" (1886); "Canada: Scenic and Descriptive" (1889); "China and its People" (1893); etc.

**Withy,** one of the names for *Salix fragilis*, a large tree, 80 or 90 feet high, with a girth sometimes amounting to 20. The leaves, which are more or less lanceolate, with half-cordate stipules, are downy when young. The spreading catkins appear in April and May. Called also the crack-willow, this name and the Latin specific name, *fragilis*, both referring to the fact that the twigs are very fragile at their junction with the branches. It grows in marshy localities in the European continent, and Western Asia. The name is sometimes applied to the genus *Salix;* also to *Laserpitium siler*, which has bipinnate glabrous leaves, the leaves of the involucre and the involucels linear-lanceolate slightly awned, the fruit narrow. A native of the S. of Europe.

**Witness,** in ordinary language: (1) Attestation of a fact or event; testimony, evidence. (2) That which furnishes evidence, testimony, or proof. (3) One who knows or sees anything; one who is personally present and sees anything. In law: (1) One who sees the execution of an instrument, and subscribes it for the purpose of confirming its authenticity by his testimony; one who signs his name as evidence of the genuineness of the signature of another. (2) One who gives evidence or testimony under oath or affirmation in a judicial proceeding. Bible witnesses: Two or more witnesses were required by the law of Moses, 1451 B. C. (Deut. xvii: 6), and by the early Christian Church in cases of discipline A. D. 60 (II Cor. xiii: 1).

**Witness Tree,** a tree blazed or notched for the purpose of marking a boundary of a tract of land in the West — particularly such a tree, when intended to serve as an index of the position of the corner stakes of a square mile.

**Witsenia** (named after Nicholas Witsen, a Dutch patron of botany), a genus of *Iridaceæ*, closely akin to iris. They are natives of the Cape of Good Hope. *W. corymbosa* is a favorite in greenhouses. The stem of *W. maura* is said to abound in saccharine juice.

**Wittekind,** or **Widukind,** the leader of the Saxons in their struggle with Karl the Great; came of a noble Westphalian house, and first appears at the head of the Saxon expedition against the Westphalian fortress of Eresburg (774). The emperor's return from conquering the Lombards drove him across the Weser, and after vainly

renewing the revolt in 776, he fled to Denmark, but returning during Karl's absence in Spain, laid waste the Rhineland and surprised and annihilated the Frankish army on the Süntelgebirge (782). Karl retaliated by executing 4,500 Saxon prisoners, an action that roused the entire Saxon race to arms. The battle of Detmold was drawn (783), but that of Osnabrück crushed Wittekind's hopes and forced him to enter on negotiations, whose issue was that in 785 he accepted baptism in the imperial camp at Attigny, in Champagne. Karl, it is said, made him Duke of the Saxons and lord of Engern, and from his castle of Babilonie, near Lübeck, he exercised a mild and righteous sway till 807, when he fell in battle with Gerold, the Swabian duke. Various princely houses, as those of Brunswick and Sardinia, claim Wittekind for the founder of their line.

**Wittenberg,** a town in Prussia; province of Saxony; on the Elbe, 45 miles S. E. of Madgeburg. It was while Luther was a professor in Wittenburg that he nailed his 95 theses to the door of the Schlosskirche. The university in which he was professor was united to Halle in 1817. The principal buildings are the Schlosskirche, in which both Luther and Melanchthon are buried; the Stadtkirche, where Luther and Melanchthon preached; the remains of the Augustine monastery, with Luther's apartments; the houses of Melanchthon and Cranach; the town hall, the gymnasium, etc. Pop. (1900) 18,345.

**Wittenberg College,** a coeducational institution in Springfield, O.; founded in 1845 under the auspices of the Lutheran Church; has productive funds exceeding $350,000; grounds and buildings valued at over $200,000; scientific apparatus, etc., $25,000; volumes in the library, about 16,000; average number of faculty, 36; average student attendance, 620.

**Witthaus, Rudolph August,** an American toxicologist; born in New York city, Aug. 30, 1846; was graduated at Columbia University in 1867, and at the Medical Department of the University of New York in 1875; was Professor of Toxicology and Chemistry at the University of Cornell, and held similar chairs in other institutions. He became noted as an expert in poisons in connection with many murder cases. His publications include "Essentials of Chemistry" (1879); "General Medical Chemistry" (1881); "Manual of Chemistry" (1879); and "Laboratory Guide in Urinalysis and Toxicology" (1886); edited "Witthaus and Becker's Medical Jurisprudence" (4 vols.) for which he prepared the introduction and Vol. 4, on "Toxicology."

**Wittichenite,** or **Wittichite** (after Wittichen, Baden, where found), a mineral belonging to the sulphobismutite section of the sulpharsenite and sulphantimonite group; crystallization, orthorhombic, though occurring mostly massive; hardness, 3.5; sp. gr., 4.3–5; luster, metallic; color, steel-gray, tarnishing on exposure; streak, black; composition: Sulphur, 19.44; bismuth, 42.11; copper, 38.45, which yields the formula $3CuS + Bi_2S_3$; another analysis gives the formula $3(CuFeS) + Bi_2S_3$.

**Wittingite** (after Wittingi, in Storkyro, Finland, where found), an amorphous mineral, apparently resulting from the alteration of rhondonite; composition: A hydrated silicate of the proto- and sesquioxides of manganese and iron. A doubtful species. Grouped by Dana with Neotokite.

**Witwatersrand** (Anglicized WHITE WATER RANGE), the name of a height of land in the Transvaal, South Africa, running S. and S. W. of Pretoria, and located between the Klip and Vaal rivers on the S. and the Limpopo on the W. It is about 100 miles long and extends nearly E. and W. with lat. 26° S. In 1886 gold was first discovered here, and since that date the region has developed into the most famous gold mining district in the world. In 1895 its production was valued at over $38,000,000, only about $8,500,000 less than the yield from the combined mines of the United States. Prior to the discovery of gold the land was thought to be good for nothing but to pasture cattle. It comprises an elevation on a barren plateau, and consists of sandstones, shales, conglomerates, and quartzites. Nearly all of the gold is found in the conglomerates which are known as "banket reefs." The conglomerate formation dips under the surface of the ground presumably to a depth of 5,000 feet where experts say gold may be mined. At first mining was carried on along the surface conglomerate, but later shafts were sunk to a depth of 2,000 feet. A conservative estimate places the value of gold in this formation at $3,500,000,000, which is 10 times greater than the gold and silver product of the celebrated Comstock Lode. Nevertheless the mining of ore in the Witwatersrand is difficult and expensive, and does not repay poor men nearly as well as mining in Australia and California. Still many miners from all parts of the world have swarmed to South Africa and considerable suffering has resulted. In this region are also found valuable deposits of coal and iron. Since the discovery of gold the most noted town in South Africa, Johannesburg, has been built. It is comprised mostly of well built structures, including banks, churches, clubs, etc. A railroad runs to Cape Town nearly 1,000 miles distant, to Natal on the S., and to Pretoria and Delagoa Bay.

Witwatersrand

*Estimated Future Production.*— The entire mineral development of the country has taken place within 30 years, for mining in the Transvaal was prohibited up to 1868, at which time the government, being in dire financial straits, threw open the gold fields to exploration and exploitation, even going so far as to offer a bonus for the discovery of profitable mines. The resultant prospecting in the early seventies led to the discovery of quartz veins and the inauguration of mining in several parts of the Northern Transvaal.

The Lydenburg district first attracted attention in 1876, when exploration of the alluvial deposits began, followed later by vein mining. The De Kaap gold fields were discovered in 1884, and the conglomerate or "banket" beds of the Witwatersrand — destined to supersede all others in importance — in 1885. In that year a small stamp battery was erected to crush quartz from a vein a few miles W. of Johannesburg, and in this a crushing of conglomerate was made; but it was not till April, 1887, that a battery of three stamps was erected to treat the ore of the Witwatersrand banket. This was followed by the erection of other batteries, and the output of gold for 1887 was 23,000 ounces. For 1898, the last complete year before the Boer war, it was 4,295,659 ounces, valued at $60,000,000, and for nine months of 1899 it was 4,008,326 ounces.

There were at the end of 1898 79 mines, which in 1898 produced 7,331,446 tons of ore, crushed by 4,765 stamps. They employed 9,476 white men with an average monthly wage of $125 and 88,627 native workmen, receiving on an average $12.50 each a month. During the same year in the Lydenburg district five companies, running 137 stamps, produced 154,560 tons of ore, yielding 108,884 ounces of crude gold, valued at $1,950,000 and in the De Kaap gold fields seven companies, running 200 stamps, produced 89,760 ounces of crude gold, valued at $1,575,090.

The companies ceased working in October, 1899, by reason of the declaration of war, but the late Transvaal government continued operation on its own account in some of the richest mines up to May, 1900. In May, 1901, crushing operations were resumed by the companies themselves, though upon a very small scale, only 150 stamps being run at three mines. The number was steadily increased, and by the end of 1901, 653 stamps were running, representing 12 mines; during the eight months ending with the year 412,006 tons of ore were milled, 238,995 ounces of fine gold, valued at $5,000,000 were produced, and $2,000,000 were paid in dividends.

Notwithstanding the change in the political status of the Transvaal which will follow the recently concluded peace and final establishment of British rule, it may be confidently assumed that the main features of the mining law of the South African republic will be retained, and certain oppressive features of monopolies, etc., bearing with special weight on the mining industry, will be abolished. The dynamite monopoly was one that bore most heavily on the mining industry; and, according to the reports of the State mining engineer, explosives, including fuse and detonators, amounted to nearly 10 per cent. of the total working costs of the mines. Furthermore, it was impossible to obtain the proper quality for the most economical working, and often 30 per cent. or 40 per cent. gelatine had to be used in many instances where 60 per cent. gelatine would have been much cheaper. These, indeed, form no part of the mining law proper — that is, the law regulating the tenure of mining titles. It is to be expected, both in the nature of the case and in view of the declarations already made by British statesmen, that the "ancient laws and customs" of the Transvaal will be retained under British rule, as far as possible. At all events, the principles of the English common law and the immemorial precedents of English practice will undoubtedly require the determination of present rights according to the statute in force at the time of their inception. The mine operators of the Transvaal whose titles were acquired from the republic will therefore be secured in the position thus defined.

During the eight months ending in August, 1899, after which the commencement of active hostilities interfered with the active working of the mines, the Witwatersrand produced $60,000,000. At this rate the year's production would have been $90,000,000. As a matter of fact, it would have amounted to some $100,000,000, by reason of the progressive increase in the monthly production already shown during that year. Of this output 71 per cent. was derived from what is known as the central section, extending about one and five-tenths mile W. and about 8 miles E. of Johannesburg, and 24 per cent. was derived from the deep level properties within that section. The total gold product of the Witwatersrand was 25.5 per cent. of that of the entire world.

Notwithstanding the greatly increased production of gold elsewhere, this ratio would have been more than maintained had mining operations not been interfered with by the South African war. Within one year after the resumption of mining operations, on the scale existing immediately prior to the war, an output of gold at the rate of over $100,000,000 annually may be reasonably estimated; and this rate of production will be steadily increased, partly by the increase in the crushing plants of some of the companies, but more especially by

the starting of many of the deep level properties which will then reach the producing stage.

Within the next three or four years, after operations have been resumed on a large scale, the annual gold production from the Witwatersrand may reach $125,000,000. Beyond this amount there should be a further increase, the amount of which it is impossible to estimate. In from six to eight years some of the important gold producers among the outcrop companies will fall out of line, by reason of the exhaustion of their mining areas. To what extent this deficit will be counterbalanced by increased yield in the deeper level properties cannot be as yet determined. Much depends on the policy adopted by the larger companies owning these properties.

In the reliability of its ore bearing formation the Rand is unique in the history of gold mining, but in the minds of many an exaggerated importance is attached to the persistency of payable ore bodies in strike and in dip. There is, indeed, considerable fluctuation in the value of the ore within the same reef, even within short distances; but a remarkably even grade of ore has been maintained since the inception of the industry.

Where there has been an apparent falling off in yield of a ton during any year, the fact is to be attributed rather to the working of lower grade ores made possible by improved economic conditions, than to a depreciation in the ore values of the reefs themselves. With the exception of the additional costs of haulage, pumping and ventilation, there are no factors operating against mining on the Witwatersrand to a depth of at least 8,000 feet vertically. These costs will not afford any insuperable obstacle to profitable mining, provided, of course, the geological character of the deposit is not adversely changed. So reliable is the formation, from a geological point of view, as regards its mining potentialities, that engineers have felt justified in assuming the existence of payable ore at depths of 1,000 feet vertically and upward beyond the extent in depth of any mining operations. Thus far the results of actual operations on these areas have justified their position. It is estimated that for every mile in length along the course of the reefs, down to a vertical depth of 1,000 feet for the dip of these reefs, gold to the value of about $50,000,000 will be extracted. This is a conservative estimate — at least as applied to the central section of the Rand. If we assume these conditions to obtain to a depth of 6,000 feet vertically, we have the enormous sum of $300,000,000 for each mile in length. It is not unreasonable to suppose that these conditions will be maintained along most of the central section, say for a distance of 10 miles, in which case we would have an auriferous area, within practicable mining depths, containing upward of $3,000,000,000 value of gold.

It is less safe to make any prediction of the gold product to be expected from the E. and W. sections; but it is perfectly safe to say that the output of these sections would very greatly augment the amount I have named. Messrs. Hatch and Chalmers, well-known engineers of extensive South African experience, compute the available gold from these portions of the Rand at $1,000,000,000.

It is impossible to predict with any accuracy the duration of mining in the Witwatersrand district, by reason, especially, of the indeterminate factor of the rate at which exploitation will be carried on. It may be observed, however, that the tendency is to exploit the auriferous areas as rapidly as possible, and that engineering methods are all adopted with that end in view. If the exploitation of the deeper levels is not delayed pending the proving of the ground lying above, but is carried on concurrently with the exploitation of the higher horizons of the reefs, the industrial life of the district will, of course, be correspondingly shortened. The working of lower grade ores, made possible by improved economic conditions or other circumstances, would tend to increased longevity of the industry. But, were I called on to express an opinion, I would estimate the future duration of profitable operations on a large scale in the district at less, rather than more, than 25 years.

The future looks from all points of view encouraging. We may reasonably anticipate important improvements in economic conditions as the result of the establishment of a better government. I believe that, as the result of economic reforms, there will be an ultimate saving of $1.50 a ton of ore treated, as compared with the conditions under which mining has been carried on under the government of the late South African republic. This refers to all savings, both direct and indirect, and especially to economy resulting from increased efficiency of labor due to the betterment of living conditions. Positions formerly commanding a salary of $15,000 a year will be satisfactorily filled for $10,000. For the tonnage of ore crushed in 1898, this would result in an increase of annual dividends of $10,000,000.

JOHN HAYS HAMMOND.



**Witzel, Georg,** a German theologian; born in Vacha in 1501. He studied theology at Erfurt, and was ordained priest. He embraced the Reformation, but relapsed into Romanism, violently attacked the Lutheran doctrines, and was expelled in 1530. His principal work was "Typsus Ecclesiasticus" (5 vols. 1540–1548). He died in Mayence in 1573.

**Wixom, Emma.** See NEVADA, EMMA.

**Woad,** a cruciferous plant of the genus *Isàtis,* the *I. tinctoria,* formerly cultivated to a great extent in Great Britain on account of the blue dye extracted from its pulped and fermented leaves. It is now, however, nearly superseded by indigo, which gives a stronger and finer blue. The ancient Britons are said to have colored their bodies with the dye procured from the woad plant. Wild woad, weld, or wold, is the *Reseda Luteola,* an English plant which yields a beautiful yellow dye.

**Woburn,** a city in Middlesex co., Mass.; on the Boston and Maine railroad; 10 miles N. W. of Boston. It contains a public library, high school, Warren Academy, the birthplace of Benjamin Thompson (Count Rumford) preserved by an association, numerous churches, waterworks, electric street railroads, electric lights, National and State banks, and several newspapers. It has the largest leather industry in New England, and manufactories of shoes, chemicals, glue, electric dynamos and lamps, etc., and an assessed property valuation exceeding $10,500,000. Pop. (1890) 13,499; (1900) 14,254; (1910) 15,308.

**Wocheinite** (after Lake Wochein, Styria, near which it was found), a variety of BEAUXITE (*q. v.*) containing very little oxide of iron. Till recently this mineral and beauxite have been used as some of the sources of the metal aluminium.

**Woden,** the principal deity of the German and Scandinavian mythologies, common to all Teutonic peoples, and, in a measure, corresponding to the Zeus of the Greeks. Odin, while not the creator, is the ruler of heaven and earth, an omniscient being, the king of the deities. His celestial residence is the palace Heidskialf, in Asgard, from whence his two black ravens, Hugin (Thought) and Munin (Memory), are sent forth daily to gather and bring in tidings of all that is taking place in earth and heaven. He is also the god of war, holding his court in Valhalla, whither brave warriors pass after death to revel in joys of battle and the hunt, such as they loved best on earth. Odin became the wisest of the gods by the aid of a draught from Mimir's fountain, though in doing so he lost the sight of one eye. Like Zeus, he added to his queen, Frigga, various other wives and favorites, and had a numerous progeny of sons and daughters. According to Rhys, Odin, or Woden, the sky god of the Teutons, may have had a Celtic origin, and been synonymous with the Celtic Gwydion.

**Wodrow, Robert,** a Scotch clergyman; born in Glasgow, Scotland, in 1679; was educated at Glasgow University, and became minister of the parish of Eastwood, Renfrewshire, in 1703, where he remained all his life. He published "The History of the Sufferings of the Church of Scotland from the Restoration to the Revolution" (1721); and wrote a series of Scotch ecclesiastical biographies, the MSS. of which are preserved in Glasgow University. From these there has been edited for the Maitland Club, by Rev. Dr. Leishman, "Lives of the Reformers and most Eminent Ministers of the Church of Scotland" (1834–1845). He has also edited Wodrow's "Analecta, or Materials for a History of Remarkable Providences" (1842–1843); and the Wodrow Society (formed in Edinburgh in 1841 for the publication of works of the early writers of the Reformed Church of Scotland) has published "Wodrow's Correspondence" (1842–1843), under the editorship of the Rev. Thomas McCrie. Wodrow died in Eastwood, March 26, 1734.

**Woehlerite** (after the chemist Friedrich Wöhler of Göttingen), a monoclinic mineral, occurring in crystals, mostly tabular in habit, and also granular; hardness, 5.5; sp. gr., 3.41; luster, vitreous color, shades of yellow, sometimes brownish; transparent to sub-translucent; composition: Essentially a columbo-silicate of zirconia, lime, and soda. Occurs in zirconsyenite on the islands of the Langesund Fiord, Norway.

**Woelchite** (after Wölch, Carinthia, where found), an altered variety of Bournonite, in which Rammelsberg obtained as a mean of several analyses: Sulphur, 16.81; antimony, 24.41; lead, 15.59; copper, 42.83; iron, 0.36 = 100.

**Woffington, Margaret,** a British actress; born in Dublin, Ireland, Oct. 18, 1720. She grew up a girl of remarkable grace and beauty, and, still a child, became a pupil of Madame Violante, mistress of a rope-dancing booth. From 17 to 20 she played on the Dublin stage all manner of parts, from Ophelia to Sir Harry Wildair, and on Nov. 6, 1740, made her first appearance at Covent Garden as Sylvia in the "Recruiting Officer." Her beauty and grace, her pretty singing and vivacious coquetry, and the exquisite art especially of her male characters carried all hearts by storm. Her one drawback was the harshness of her voice, yet this in no degree hindered the completeness of her triumph. Peg Woffington was always singularly independent and something whimsical in her moods, but she kept the affection of the public till the tragic close of her career. On May 3, 1757, she broke down in playing Rosalind, and left the stage forever. She died in Teddington, March 28, 1760.

**Wofford College,** a coeducational institution in Spartansburg, S. C.; founded in 1854 under the auspices of the Methodist Episcopal Church, South; has productive funds exceeding $125,000; grounds and buildings valued at over $320,000; scientific apparatus, etc., $16,800; volumes in the library, about 18,500; average number of faculty, 18; average student attendance, 410; graduates, over 800.

**Woiwode,** an old Slavonic name for a general, afterward used as a title of civil rank and authority. The princess of Walachia and Moldavia were called woiwodes, and this title was also supplied at an early period to the Polish kings.

**Wolcot, or Wolcott, John** (PETER PINDAR), an English poet; born in Dodbrooke, England, in May, 1738. His satires involved him in many quarrels. So effective were his attacks on the king, that the ministry silenced him with a pension of $1,500 per annum. He was an art critic of taste and penetration far beyond his time; his yearly reviews in verse of the Academy Exhibitions are much the best of his work, and still instructive. Some of his satires are: "Lyric Odes"; "An Epistle to the Reviewers"; "Peeps at St. James"; "Royal Visits"; and "The Lousiad." He died in London, England, Jan. 14, 1819.

**Wolf,** the vernacular name of certain species of the genus *Canis;* for a general account of which see DOG. The principal forms included in this section are as follows: (1) The common wolf (*C. lupus*) has very much the appearance of a large, long-legged, bare-boned dog, with a long tail, which hangs over its haunches instead of being curled upwards. Distinguishing characters are to be found in the lank body, length of the snout in proportion to the head, sloping forehead, oblique eyes, and erect ears. The fur varies according to the climate with respect both to its nature and color. In the N. it is long and thick — longest on the belly and legs, bushy on the tail, and erect on the neck and sides — while in the S. it is generally shorter and rougher. The color is usually pale yellowish gray mingled with black, lighter, often whitish gray below. It undergoes some change with the season, inclining to red in the summer, in the winter to yellow, which becomes white in the N.; it is of a darker hue in the S. The forehead is whitish gray, the snout yellowish gray, always mingled with black, the lips whitish and the cheeks yellowish, sometimes indistinctly striped. A full-grown wolf measures 5 feet 5 inches in length, whereof 18 inches belong to the tail; its height is 33 inches, and its weight over 100 pounds. The wolf's natural voice is a loud howl, but when confined with dogs it will learn to bark.

Wolves inhabit a great variety of country, both hill and plain, especially thick forests and broken ground, with alternate morasses and dry patches, and in the S. the steppes. They shelter in woods, marshes, canebrakes, and maize fields, roaming over wide areas, often suddenly appearing where none have been seen for years, and as quickly vanishing — nor is this wonderful when it is remembered that they will cover from 25 to 40 miles in a single night. In the neighborhood of dwellings they only appear after twilight, but in secluded places carry on their hunting all day. Their food varies according to the season, consisting in summer almost exclusively of wild animals — foxes, hedgehogs, mice, birds, reptiles, and even vegetables; of larger animals, elk and deer, while hares are soon exterminated where wolves abound. They follow herds of lemmings in their migrations, and will devour carrion with avidity; but they do not appear to attack man unless in large numbers or pressed by hunger. In winter they

THE WOLF.

approach nearer to human habitations, doing much damage to flocks and poultry. When in packs they will attack horses and cattle. In the chase the wolf exhibits all the cunning of the fox, and in addition courage and the capability of hunting in packs. These will even divide in parties, one following the trail of the quarry, the other endeavoring to intercept its retreat. In mental qualities the wolf is in every respect the equal of the fox; his caution is so great that he regards every unfamiliar object with suspicion, will not pass through a door if he can leap over the wall, and will not, unless famished, attack a tethered animal lest it should be the bait of a trap. When he sees himself captured his courage and ferocity at once forsake him, so that we may readily credit Conrad Gesner's story of an old woman, a wolf, and a fox falling successively into a pitfall, and each keeping aloof from the others.

Wolf

In spring and summer wolves are solitary or in pairs, in the autumn in families, and in winter in packs. The pairing season is in December and January, when the males fight savagely together; those who are fortunate enough to secure a mate remain with her till the young are well grown. The period of gestation is 63 days, and from three to nine (usually four to six) cubs are found in a litter; these are blind for 21 days, and are suckled for two months, but at the end of one month are able to eat half-digested flesh disgorged by the mother. They quit the parents in November or December, but many remain together six or eight months longer; they are full grown in three years, and live from 12 to 15 years. The stories of children having been brought up by wolves (Sleeman's "Journey through Oudh," 1858, gives several such) require further confirmation. Wolves can readily be tamed when taken young, and then exhibit all the characteristics of domestic dogs. F. Cuvier tells of one presented by its master to the Jardin des Plantes, which recognized him with every manifestation of joy after intervals of one and a half and three years.

Notwithstanding the spread of civilization, the wolf is still widely distributed. Excluding thickly populated regions, it extends over almost the whole of Europe; it is not infrequent in Spain, Greece, and Italy, as well as France. So recently as 1885–1886 no less than 39 were killed in Alsace-Lorraine, and two in the Rhine provinces. It is rarer in Switzerland, and in mid and N. Germany has been exterminated, as in Great Britain. Eastern Europe, Russia, and Scandinavia are the only parts where it now occurs in any large numbers. It never seems to have existed in Iceland, or in the islands of the Mediterranean. In Asia it is spread over all the center and N. E., over Afghanistan and Baluchistan to Sind, and possibly over the higher Punjab. The distribution of the North American variety will be given below. In Great Britain it appears from geological evidence that the wolf must have existed in almost every county. Hunting it was a favorite pastime among the ancient Britons and Anglo-Saxons. In the reign of Athelstan one Acehorn built a refuge for wayfarers near Filey in Yorkshire; and the tribute of 300 wolf skins annually levied by Edgar on the Welsh is a matter of common repute, though it did not cause the extermination of these animals as is sometimes stated, for we find that Henry III. granted lands on condition of the wolves being destroyed. Three shillings were paid for three wolves killed near Lichfield in 1334; Nottinghamshire was infested as late as the 11th year of Henry VI., but no mention of them in England occurs after the reign of Henry VII. (1485–1509). In Scotland we have the well-known story of Sir Ewen Cameron of Lochiel killing the last in the country in 1680; but there is reason to believe that individuals existed in Sutherlandshire, as also on the Findhorn river till 1743. In Ireland we have a proclamation forbidding the export of wolf dogs in 1652, and the ultimate disappearance of wolves has been placed about 1766.

The following forms, which appear to be varieties of the common wolf, have been at different times described as distinct species: (*a*) *C. niger* is based on two specimens, formerly in the possession of the British Zoölogical Society, obtained by Lieutenants Kinloch and Biddulph in Tibet in 1887, Their distinctive marks are said to be shaggy fur, which is black, except for a white muzzle, feet, and patch on the breast. (*b*) *C. chanco* is a pale variety from Chinese Tartary, Hodgson says it is common in Tibet. (*c*) *C. pallipes* is said to be smaller and slighter than the typical form, with little or no under-fur; but undoubted examples of *C lupus* differ as much from each other as this does from them. It inhabits the plains S. of the Himalayas, but is rare W. of the Indus. It does not hunt in large packs, but in numbers of six or eight at most. The superstition of the people prevents its destruction, for they imagine that its blood will diminish the fertility of the fields. It is seldom heard, not howling like the European wolf. It is remarkable even among wolves for speed and endurance. (*d*) *C. occidentalis* (the American wolf) is less red and blacker on the back, though not to so great an extent as many Spanish wolves. Formerly it was very numerous in the plains, hanging on to the herds of bison, killing weaklings and calves. Sometimes it is very ferocious, even attacking man, but nevertheless has been known to satisfy its hunger with berries. It inhabits burrows with several openings. As late as 1870 it was found in Massachusetts, but at the present day it is found E. of the Mississippi and S. of Canada only in unsettled parts of South New England, New York State, the Alleghenies, and the S. of Florida, and possibly the S. of Ohio; it is abundant only in remote districts of Maine. N of this it is still quite common, extending as far as Greenland. Its S. limit seems to be the province of Guanajuato in Mexico. (*e*) *C. hodophylax* (the "Jamaina" of the Japanese) inhabits the woody and mountainous parts of Japan, where it hunts in small packs or families, and is much dreaded by the natives. It is of small size, and has short legs and an elongated muzzle. (*f*) *C. lycaon* is a name which has been given to the European black variety.

The following may be regarded as distinct species: (2) *C. simensis* (Abyssinian wolf), described by Rüppell from specimens

captured in the mountains of Semyen (Simen), is as large as a big sheep-dog, and has a very long muzzle. It is of a pale reddish brown, lighter below; white round the mouth and eyes, the margins of the ears, chest, and forepaws; the end and upper part of the tail are black. It does not appear ever to attack man.

(3) *C. antarcticus* (the Antarctic wolf) is an inhabitant of the Falkland Islands, and much alarmed the early explorers by its bold approach, which was, however, merely the confidence due to unfamiliarity. Darwin tells us that at the time of the visit of the "Beagle" they would steal meat from under the head of a sleeping man, while the gauchos would kill them by holding out a piece of meat in one hand and a knife in the other. They feed on the native geese, and burrow like foxes. They are solitary, and are silent except in the breeding season. The fur is moderately long, of a yellow color, speckled with black, paler below; the lips, chin, and throat are white, but the most characteristic mark is a black patch just above the heel.

(4) *C. jubatus* (maned wolf) is the largest of its family in South America. It occurs in Paraguay and adjoining regions, and is easily distinguished by its long limbs and large ears. It has longish hair of a bright yellowish red, and a stripe of black down the middle of the neck, which, however, scarcely deserves the name of "mane." There is a black patch below the jaw and on each foreleg; the front of the throat and end of the tail are white. It inhabits low moist localities, and is said not to be dangerous to man or to domestic animals, except perhaps sheep. Its local name is "A-gua-a," perhaps from its cry.

(5) *C. latrans* (prairie wolf or coyote) has now been exterminated over large tracts in Kansas, Nebraska, etc., but it may still be found where the common wolf has disappeared, owing to its smaller size and less dangerous character. It extends as far as lat. 55° N., and S. to Costa Rica, and is abundant in Northern Mexico, New Mexico, and Texas. Its color varies with the season, being a bright tawny brown in summer and grayish or quite gray in winter. It has black stripes along the back and across the shoulders and hips; it is dingy white below, and tawny above the muzzle and outside the ears and legs. It is really a slender animal, but looks stout by reason of its thick coat. It causes much annoyance by its howling in the night, two or three producing the effect of 10 by their numerous notes and their uninterruptedly succeeding each other. It eats all kinds of animal substances, and is the scavenger of hunting and traveling parties. In autumn it devours the prickly pear fruit, and in winter cranberries. Its cunning is so great that it is difficult to trap, and hence is killed by poisoning a bait, made more attractive by asafœtida. It will not attack man unless wounded. It breeds in retreats among the rocks, 5 or 6, rarely 10, young being born in May or June.

*C. lupus* has been found fossil in Pleistocene deposits in various parts of Europe. An allied extinct form is *C. cantleyi* of the Indian Pliocene, probably the ancestor of *C. pallipes*. *C. nescherensis*, from the Upper Pliocene of France, is a smaller form; and *Lycorus*, from the French Pleistocene, is evidently a wolf, though it has only three pre-molar teeth.

**Wolf, Edmund Jacob,** an American clergyman; born in Rebersburg, Pa., Dec. 8, 1840; was graduated at the Pennsylvania College, Gettysburg, in 1863, and then served with the Union army during the remainder of the Civil War. Subsequently he studied theology; was ordained in the Lutheran Church; and became Professor of New Testament Exegesis and Church History at the Theological Seminary, Gettysburg, in 1874. He was author of "Lutherans in America"; the 10th vol. of the "Lutheran Commentary"; "Lectures on the Gospel Lessons"; etc. He died Jan. 10, 1905.

**Wolf, Ferdinand,** an Austrian Romance scholar; born in Vienna, Austria, Dec. 8, 1796; studied philosophy and jurisprudence at Gratz; then accepted a post in the royal library at Vienna. He took an active part in the foundation of the Academy of Sciences. Among his books were "Collection of Modern Castilian Rhymes"; "Historical Studies of Spanish and Portuguese National Literature"; "History of Brazilian Literature"; etc. Together with C. Hofmann he edited a collection of the oldest Spanish romances. Besides he made numerous contributions of the greatest value on questions of Romance scholarship to the Vienna "Literary Chronicle." He died Feb. 18, 1866.

**Wolf, Friedrich August,** a German scholar and critic; born in Haynrode, near Nordhausen, Prussia, Feb. 15, 1759. Before leaving the gymnasium of Nordhausen, he had not only read the chief ancient authors, but had acquired an extensive knowledge of the languages and literatures of France, England, Italy, and Spain. In 1777 he entered the University of Göttingen, but was an irregular attendant at professors' lectures, giving himself chiefly up to intense and solitary study. As a consequence he was hardly known, and where known not particularly liked. In 1782 he was appointed rector of the Bürgerschule at Osterode in the Harz, and next year he was called to Halle as Professor of Philosophy and Paideutics. Here he labored upward of 20 years with the highest enthusiasm for the

cause of education. His ambition was to produce a great race of teachers, who should be instinct with the noblest and purest spirit of antiquity. In 1793 appeared his great work, "Prolegomena in Homerum" (3d and 4th eds. 1872 and 1875). In this he affirmed that the two great Grecian epics were not the work of one man, but of a number of Homeric rhapsodists, and he set himself with all his vast resources of learning and genus to prove his thesis. This "epoch-making" work created a profound sensation, and though it may be too much to say that he absolutely succeeded in proving his contention, yet it has had the effect of profoundly and permanently modifying the opinions of Homeric scholars on the maner of the composition of the "Iliad" and "Odyssey." From a literary point of view his labor has been of immense service. He forever dispelled that exaggerated and unmeaning worship of "Homer," which, combined with an utter want of appreciation of

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the real merits and beauty of Homeric poems, was so ridiculous a feature of the old classical scholarship. The University of Halle was suppressed in 1807, and Wolf, who had repeatedly declined calls to other universities, then removed to Berlin, where he entered the ministry of Public Instruction, but soon resigned his office that he might give himself unreservedly to work of academic teaching, which was the most sacred passion of his life. In 1824 he went S. on a voyage for the sake of his health, but died in Marseille, Aug. 8, of that year. During a long lifetime devoted to classics, he published a large number of works. Of these may be mentioned his editions of Homer (4 vols. 1794–1795), many orations of Cicero, dialogues of Plato, and plays of Aristophanes, besides various works on classical antiquities.



**Wolf, or Wolff, Johann Christian von,** a German philosopher; born in Breslau, Germany, in 1679. In 1707 he became Professor of Mathematics at Halle, and in 1721 was appointed counsellor to the court of the King of Prussia; but some of his religious and metaphysical opinions giving offense to the faculty of theology, he was banished from Halle; on which he removed to Cassel, became counsellor to the landgrave, and obtained a professorship at Marburg. He was also honored with marks of distinction by the King of Sweden, and was elected a member of the Academies of Sciences of Paris and St. Petersburg, and fellow of the Royal Society of London. In 1741 he was recalled by Frederick the Great, who appointed him privy councillor, vice-chancellor, and Professor of International Law. He was afterward made chancellor of the university, and the Elector of Bavaria created him a baron. His principal works are, "A Course of Mathematics"; "Philosophia Rationalis"; a "System of Metaphysics"; and a "Dictionary of the Mathematics." He died in 1754.

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**Wolf, Rudolf,** a Swiss astronomer; born in Zurich, in 1816; teacher of mathematics and physics in the realschule at Berne, 1839–1855; director of the observatory there 1847; Professor of Astronomy in the Berne University in 1853; Professor of Astronomy in the Polytechnikum and director of the observatory at Zurich in 1855, and later Professor of Mathematics and Astronomy in the university there. He was celebrated for his investigations concerning the periodicity of sunspots and the accompanying magnetic variations, and for his extensive writings on the history of science, especially astronomy. His "Astronomical Miscellany" is a well-known series of papers, and his "History of Astronomy" is a standard work of reference.

**Wolf, Theodore Frelinghuysen,** an American physician; born in Kenvil, N. J., in 1847. His books: "A Literary Pilgrimage among the Haunts of Famous British Authors"; and "Literary Shrines: The Haunts of Famous American Authors," were among the popular works of the day. His professional writings include works on tetanus and anæsthesia.

**Wolfachite** (after Wolfach, Baden, where found), an orthorhombic mineral occurring in small crystals encrusting nickeline; hardness, 5.5; sp. gr., 6.372; luster, metallic; color, silver to tin white; streak, black. An analysis yielded: Sulphur, 14.43; arsenic, 38.46; antimony, 13.17; lead, 1.32; silver, 0.12; iron, 3.71; nickel, 29.53 = 100.74, which is the same composition as the cubic corynite, so that the compound is dimorphous.

**Wolf Dog,** a variety of *Canis familiaris,* used for hunting; formerly abundant in Norway and Sweden, but now almost entirely confined to Spain. It is of large size, little, if any, smaller than the mastiff, nose pointed, ears erect, hair long and silky, usually white, with large patches of brown; tail curled over the back.

**Wolfe, Charles,** an Irish poet; born in Dublin, Ireland, Dec. 14, 1791; was educated at Trinity College, Dublin, and it was while there that the poem which has secured his fame, "Ode on the Burial of Sir John Moore," was published in the "Newry Telegraph" (1817). He was also the author of several other poems, and his "Remains" were published at Dublin (1825). He died at the Cove of Cork (now Queenstown), Ireland, Feb. 21, 1823.

**Wolfe, James,** an English military officer; born in Westerham vicarage, Kent, Jan. 2, 1727; was educated at Westerham and Greenwich. From the first he was bent upon following his father's profession of arms; and, balked by illness at 13 of a share of the unfortunate Cathagena expedition, in 1742 he received an ensign's commission in a foot regiment. In 1743 he took part in the famous battle of Dettingen, boy though he was, as adjutant of his regiment; in 1744 he obtained his captaincy; and in 1745–1746 he served against the Scotch, being present at the battles of Falkirk and Culloden. Again abroad on service in 1747, he was wounded, though not seriously, at the battle of Lawfeldt, and so distinguished himself that he was publicly thanked by the Duke of Cumberland. From 1749 to 1757, with occasional interruptions, such as a six months' residence in Paris, he was engaged in garrison duty in Scotland and England; his interesting correspondence with his mother shows that he had no great liking for the former country and its inhabitants. In the mismanaged expedition against Rochefort (1757) Wolfe acted as quartermaster-general. The total failure of the operations brought disgrace to nearly all concerned; but it became known that had Wolfe's counsels been followed the result would almost certainly have been different. Pitt's attention was now first decisively drawn to him as an officer of whom great things might be expected; and in 1758, with the full rank of colonel, he was appointed to the command of a brigade in the expedition against Cape Breton under General Amherst. A brilliant success was obtained in the capture of the strong fortress of Louisburg, after a seven weeks' siege, and he became popularly known as the "Hero of Louisburg."

Pitt was now organizing his grand scheme for expelling the French from Canada; he sought for merit wherever it was to be found; and the expedition which had for its object the capture of Quebec, the enemy's capital, he confided to Wolfe's command, allowing him, as far as possible, a *carte blanche* in the choice of his subordinate officers. Advanced to the rank of Major-General, and commanding 9,000 men, Wolfe sailed from England on Feb. 17, 1759, and on June 26, landed his forces on the Isle of Orleans, opposite Quebec. The system of defense adopted by his adversary, the skillful and wary Montcalm, was such as to offer no point of advantage. The season wore fast away during which operations could be continued; but at last, having dropped down the river, and scaled the cliffs at a point insufficiently guarded — a feat of such frightful risk as in war has scarcely a parallel — at daybreak of Sept. 13, Wolfe found himself on the Plains of Abraham, where, his supplies thus cut off, Montcalm had no choice but to give battle. After a short struggle the French were driven from the field in complete rout; Montcalm was one of 500 killed; the capitulation of Quebec followed five days after; and its fall decided the fate of Canada. Wolf died in the hours of victory, Sept. 13, 1759. In person he led the right, till thrice wounded, he was carried to the rear. He lived to hear the cry, "They run; see how they run!" and expired with the words, "Now God be praised, I will die in peace." His body was taken home and buried in Greenwich church, and a monument was erected to him in Westminster Abbey.

**Wolfenbüttel,** an old town of Brunswick, Germany; on the Oker; 7 miles S. of Brunswick. One of the old churches contains many of the tombs of the princes of Brunswick. The old castle now accommodates a seminary for teachers and a theater. The library opposite, built in 1723 in the form of the Pantheon at Rome, became famous for its literary wealth and for the fact that Lessing was its librarian. It was Lessing who edited the "Wolfenbüttel Fragments," professedly from anonymous MSS. under his charge, but really from the pen of his friend Reimarus, which startled the theological world of Germany. The Pantheon building had become so rickety and dangerous that it had to be taken down, being superseded in 1887 by a handsome new

edifice, which houses 300,000 volumes (including 800 Bibles and a large number of incunabula) and 10,000 MSS. — one of them the 14th-century manuscript of Fordun's "Scotichronicon" stolen by M. Flacius Illyricus. There are in the town manufactures of machines, copper goods, flax, cloth, corks, leather, preserves, tobacco, etc. The place is very ancient, and dates from 1046; it was beseiged and taken in 1193 and 1542; and during the Thirty Years' War a battle was fought here in 1641. Pop. 14,480.

**Wolff, Albert,** a French author; born in Cologne, Germany, Jan. 1, 1827. He settled in Paris in 1857, becoming secretary to Alexandre Dumas, père; wrote for the "Gaulois," "Figaro," "Charivari," etc. Some of these articles, collected in book form, were afterward published as "Memoirs of the Boulevard" (1866); "The Two Emperors" (1871); "Victorien Sardou and Uncle Sam" (1873); etc. He wrote also several novels and farces. He died in Paris, France, Dec. 22, 1891.

**Wolff, Julius,** a German poet; born in Quedlinburg in the Harz Mountains, Sept. 16, 1834. In 1869 he founded the "Harz News." He joined the army at the time of the Franco-German War, and won the Iron Cross. After this he returned to Berlin, later removing to Charlottenburg. His chief works are: "War-Songs" (1871); "Tyll Eulenspiegel Redivivus"; "The Ratcatcher of Hameln"; "Lingul the Ratcatcher's Songs"; "The Wild Huntsman" (1872); "Tannhäuser"; "Lurlei"; "The Robber Count"; "The Bachelor's Law" (1887).

**Wolff, Oskar Ludwig Bernhard,** a German novelist; born in Altona, Germany, July 26, 1799. He became Professor of Modern Languages at Weimar, in 1826, and of Modern Languages and Literature at Jena, in 1832. He wrote "Pictures and Songs" (1840); "Natural History of the German Student" (1841); "Bubbles and Dreams" (1844); "The Minor Ills of Human Life" (1846); "History of the Novel" (2d ed. 1850); etc.; and edited "Treasury of National Poetry" (4th ed. 1853); "Treasury of German Prose" (11th ed. 1875); "The German People's Treasury of Poetry" (28th ed. 1884); etc. He died in Jena, Sept. 16, 1851.

**Wolffia** (named after S. F. Wolff), a genus of *Pistiaceæ,* akin to *Lemna.* Frond oblong or subglobose, cleft near the base, rootless, spathe none, flowers bursting through the frond, another one, sessile, one-celled, style short, utricle spherical, indehiscent, with one erect seed. Only known species, *W. arrhiza,* found in ponds in England, parts of the European continent, and Western Africa.

**Wolffian Bodies,** in comparative anatomy, two important organs in the vertebrate embryo, serving the purpose of temporary kidneys, from which true kidneys are developed, except in the fishes. They consist of a series of blind appendages, secreting a fluid which is conveyed by a duct on each side into the allantois. In man the Wolffian bodies make their appearance toward the first month of embryonic life, decreasing about the beginning of the third month, the true kidneys increasing in a corresponding ratio.

**Wolffianism,** or **Wolfianism,** in philosophy, the system developed from Leibnitzianism, by Christian Wolff. He appropriated the conceptions of Leibnitz, and modifying them to some extent, brought them into nearer agreement with the ordinary conceptions of things. He denied perceptions to all monads which were not souls, accepted the doctrine of preëstablished harmony only as a permissible hypothesis, and refused to exclude the possibility of the interaction of soul and body. He divided metaphysics into ontology (treating of the existent in general), rational psychology (of the soul as a simple, non-extended substance), cosmology (dealing with the world as a whole), and rational theology (treating of the existence and attributes of God). His moral principle was the idea of perfection; and he taught that to labor for our own perfection and that of others is the law of our rational nature.

**Wolf Fish,** the *Anarrichas lupus,* also named sea cat and swine fish, is a teleostean fish, allied to the blenny, and deriving its name from a peculiar development of the teeth, which consist of front incisors, above shelved, interlocking in an exact manner, three rows of palatal grinding teeth, and two rows of similar teeth in the lower jaw. It may attain a length of four or five feet. The dorsal and anal fins are long and single, and the tail fin is unforked. The color is an olive-green above, marbled with brown on the head especially. The fish feeds on mollusks and crustaceans. Dr. A. Wilson, describing his dissection of a wolf fish ("Nature," April, 1879), mentions that the stomach contained starfishes, shells, gravel, and crustaceans. The skin is glutinous. The wolf fish is said to be fierce, and to attack its captors. The flesh tastes like that of cod. An allied species (*A. vomerinus*) is found off the American coasts.

**Wolfhound,** or **Borzoi,** a breed of dog first imported in numbers into England from Russia, about the year 1885. In shape the borzoi is like a gigantic greyhound, though covered with a soft coat about the length of a deerhound's. In Great Britain the breed has become very popular owing to the peculiar grace and beauty of the borzoi. Though supposed to be able to attack and kill a wolf, in disposition and appearance

the Russian wolfhound is so excessively gentle that doubts have been cast on his powers. In recent trials with wolves in America the borzoi failed signally to accomplish the purpose for which he is intended. The Irish wolfhound was identical in shape and

A WOLFHOUND.

appearance with the Scottish deerhound. Attempts have lately been made to revive the breed, but it is admitted that pure specimens are no longer obtainable.

**Wolfian Theory,** or **Hypothesis,** a theory or hypothesis published by Friedrich August Wolf (1759–1824), the most distinguished German classical scholar of his time, in the Prolegomena to his second edition of Homer, sent forth in 1794 or 1795, to the effect that not merely were the "Iliad" and "Odyssey" composed by different poets, but that each of these compositions was put together from ballads preserved in the memory of itinerant minstrels or rhapsodists before writing was known in Greece, the poems taking their present form after writing was introduced in the 6th century B. C. Wolf's views attained to great celebrity, and an effort on the part of Heyne to claim priority in their discovery failed of effect. They not merely affected Homeric and other historic criticism permanently, but gave an impulse to the rationalistic treatment of Scripture which has not yet passed away.

**Wolfland,** a former nickname for Ireland, pointing to the popular notion that wolves formerly abounded there.

**Wolfram, Wolframine,** or **Wolframite,** a mineral occurring mostly in tin-producing districts, sometimes in abundance, to the detriment of the tin ores. Crystallization, orthorhombic, but usually found lamellar, massive. Hardness, 5–5.5; sp. gr., 7.1–7.55; luster, submetallic; color and streak, reddish-brown to black, opaque. Composition: A tungstate of iron and manganese, the proportions of which are variable, and lead to differing formulæ, though most can be represented by $2FeOWO_3 + 3MnOWO_3$, or $4FeWO_3 + MnOWO_3$

**Wolfram von Eschenbach** (völf'räm fon esh'en-bä*h*), next to Walther von der Vogelweide the greatest of Middle High German poets. He was poor and with a family, and could neither read nor write; but knew French and was of noble birth, which enabled him to frequent the court of Hermann of Thuringia. His chief works were three epic poems: "Parzival" (about 1210), the greatest of German court epics; "Titurel" (about 1210?), left unfinished; "Willehalm" (begun before 1216), left unfinished; both afterward completed by other hands. He wrote also lyrics, among which were four "Day Songs." He died about 1220.

**Wolf's Bane,** a poisonous plant of the genus *Aconitum* (*A. Napellus*). It is a native of Alpine pastures in Switzerland, and found in a wild state in one or two parts of England. See ACONITE.

**Wolf Spider,** a name given to spiders of the genus *Lycosa,* in which the body is large and hairy, and in which the fourth pair of feet is larger than the other pairs. It makes no web, but roams about in search of prey, and hides beneath stones, *L. tarantula* is the tarantula of Italy.

**Wolgast,** a town of Prussia, province of Pomerania; on the left bank of the Peene; 4½ miles from its influx into the Baltic, and 40 miles S. E. of Stralsund by rail. Its harbor is shallow, and larger vessels load and unload on the Ruden, an island at the river mouth. Wolgast has the remains of an old castle, the ancestral seat of the Dukes of Pomerania. Its industries are weaving, boat building, and the manufacture of leather and tobacco. It has also an active trade in ships' stores. Wolgast, which was strongly fortified early in the 12th century, was destroyed in 1628 by Wallenstein, in 1630 by the Swedes, in 1637 by the Imperialists, and in 1638 again by the Swedes. In 1675 it was taken by the Great Elector, was plundered by the Russians in 1713, and by the Swedes again in 1715. But small remains now exist of its former fortifications.

**Wollaston, William Hyde,** an English chemist; born in East Dereham, England, Aug. 6, 1766; was educated at Cambridge, took the degree of M. D., practised as a physician in London, but finally devoted himself to scientific research. He was the inventor of the goniometer, an instrument for measuring the angles of crystals, and the discoverer of palladium and rhodium,

and the malleability of platinum. He died in London, England, Dec. 22, 1828.

**Wollaston Lake,** a lake in the Northwest territory, British America. It is about 50 miles long and finds its outlet in the Mackensie river.

**Wollaston Land,** a region of British North America lying W. of Victoria Land, in the Arctic Ocean.

**Wollastonite.** See TABULAR SPAR.

**Wollin,** an island of Prussia at the mouth of the Oder; on the N. side of the Great Haff; length, 20 miles; breadth from 3 to 10 miles. Fishing and cattle-rearing are the chief employments. Pop. 14,000.

**Wollstonecraft, Mary.** See GODWIN, MARY.

**Wolseley, Garnet Joseph, Lord,** an English military officer; born near Dublin, Ireland, June 4, 1833; entered the army as ensign in 1852; took part in the second Burmese war (1852–1853), where he was severely wounded; served with distinction in the Crimea, and was wounded at the siege of Sebastopol; engaged in the siege and capture of Lucknow during the Indian mutiny of 1857–1858; and was employed in 1860 in the Chinese war. He was dispatched to Canada in 1861, and again in 1867, having received command of the Red River expedition, which he carried to a successful issue. Three years afterward Wolseley (then K. C. M. G. and Major-General) was appointed to the command of an expedition to punish the King of Ashantee, and after a brief campaign he entered Coomassie (February, 1874), and received the submission of the king, being rewarded by a grant of $125,000 and the dignity of K. C. B. After the defeat of a British force by the Zulus in South Africa in 1879 he was dispatched as high commissioner, but before his arrival the Zulus had been defeated at Ulandi, and little remained for him to do. His next command was in Egypt in 1882, where his forces successfully stormed the lines of Tel-el-Kebir and captured Arabi Pasha. For this he received the thanks of Parliament and was created a baron, his army rank being also raised to that of General. His next appointment was as Adjutant-General of the forces. When the Mahdi subdued the Sudan, and held General Gordon prisoner in Khartum, Wolseley was dispatched in 1884 with a relief expedition. He concentrated his forces at Korti, and sent a column across the desert to Khartum, but before its arrival the place had fallen. On his return to England he was created a viscount. In 1888 he was made ranger of Greenwich Park; was commander of the forces in Ireland, 1890–1895; and was then made Field Marshal and Commander-in-Chief of the British army. He wrote: "Soldier's Pocket Book" (1869); the "Field Book for the Auxiliary Forces" (1873); and a "Narrative of the War in China" (1861); "Life of the Duke of Marlborough" (1894); "Decline and Fall of Napoleon" (1895); etc.

**Wolsey, Thomas, Cardinal,** an English prelate; born in Ipswich, England, in March, 1471; was educated at Magdalen College, Oxford, where he took his degrees as a scholar of distinction. After quitting the university he was appointed to the parish of Lymington in Somerset. Then he became a private chaplain to the Archbishop of Canterbury, one of the governors of Calais, chaplain to Henry VII., and laterly Dean of Lincoln. When Henry VIII. became king the advancement of Wolsey was rapid. Successively he was appointed Canon of Windsor, Dean of York, Bishop of Lincoln, Archbishop of York, and his nomination as cardinal in 1515 and Pope's legate in 1518 completed his ecclesiastical dignities. In 1515 he was also appointed lord-chancellor of the kingdom. He was twice a candidate for the papacy, and his power in England, as also his revenues, were only equalled by those of the crown. Part of his immense revenues he expended in display, and part more laudably for the advancement of learning. He projected on a magnificent scale the College of Christ Church at Oxford; founded several lectures, and built the palace of Hampton Court, which he presented to the king. This rapid preferment by the king was largely the result of a remarkable series of diplomatic victories, in which Wolsey had been the means of enabling Henry to hold the balance between Francis I. and the Emperor Charles V. His success in the region of politics terminated in the splendors of the Field of the Cloth of Gold (1520). In his ambitious career the cardinal had made many enemies, who were held in check so long as he retained the favor of his royal master. This favor Wolsey lost when he failed to obtain from Pope Clement a decision granting the king's divorce from Catharine of Aragon. Thenceforth the enemies of the fallen prelate harried him unmercifully. He was banished from court, stripped of his dignities, found guilty of a præmunire, and sentenced to imprisonment. Finally, after a brief respite, during which he was restored to some of his offices, and had returned to his see of York, he was arrested at Cawood Castle on a charge of high treason, and on his way to London as a prisoner died in Leicester Abbey, Nov. 29, 1530.

**Woman, Legal and Political Status of.** Of all the anomalies which the progress of civilization presents, none is more wonderful than the history of women. Long held as an article of barter and trade, considered even in our own time rather as something to be possessed than as capable of possessing, the sex has yet, in the persons of individ-

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uals, been beloved, honored, idealized, crowned, and worshiped. The Christian dispensation has made woman a partaker in the great things of human destiny. Modern democracy has found it impossible to exclude her from its benefits and dignities. Finally, in a country in which education has come to be recognized as the only safeguard of public institutions, the privileges of instruction have been fully secured to her, and the immunities of ignorance have ceased to be considered as her peculiar perquisite.

This progress, slow in its inception, long continued to be almost imperceptible. We may even say that at the beginning of the 19th century the legal position of woman was one of passive endurance. In privileged circles and among good people this was not often nor generally realized; but where manners were rude and where the limitations of poverty were felt, wives and daughters became painfully aware of their pitiful condition before the law. Mothers did not own their children nor the very garments which they wore. Any money that a married woman could earn or inherit became the property of her husband, and could be taken to pay his debts. In most departments of labor, moreover, a discrimination was made against women workers, and in the few employments in which they competed with men they received for the same service a much smaller compensation. At the time referred to, and for years afterward, a married woman could neither make a will nor enter into a contract without her husband's consent. In the administration of the great interests of the community she had no part and no voice.

I wish that it were in my power to present a picture of the absolutely extralegal and extrapolitical position of the female sex at the beginning of the 19th century, in contrast with a clear impression of the almost miraculous changes shown in its present condition. The process which has effected these changes has been slow and gradual. The great lesson of justice irrespective of sex has been taught, line upon line and precept upon precept. The advocates of that justice have been met as enemies and outlawed as quasi-criminals by the very class of persons which they were determined at all costs to deliver from a barbarous oppression, made tolerable only by a growing disregard of the laws that sanctioned it.

A writer in the "Evening Post" some years ago, speaking of the opposition of many women to woman suffrage, remarked that it was strange that the sex at large should appear to be so little grateful to their would-be benefactors, if the advocates of suffrage really deserved to be so called. I longed to remind him at the time that the Founder of our Christian religion more than once spoke of Himself as in line with those prophets of the better way who had all been slain by those to whose need they came to minister.

Mary Wollstonecraft, late in the 18th century, and Frances Wright, early in the 19th, began to agitate the theme of woman's rights. The expression became at once a synonym for all that is considered unlovely and unfeminine. The advocates of the new theory, few in number as they were, were forced into a position of social isolation, in which they were commonly supposed to seek the eccentricity which was the inevitable result of the treatment received by them at the hands of the community.

After the great liberation brought in view by the teachings of Christianity, the woman-world owes its first emancipation to the Society of Friends, in which were proclaimed the spiritual equality of men and women and the right of the latter to be recognized as teachers of religious truth. Accordingly, we find Lucretia Mott present at the memorable convention in Seneca Falls in 1848, the first convention held in this country for the consideration of the civil and political rights of women. In this meeting Elizabeth Cady Stanton took a prominent part. With her appeared Frederick Douglass, gifted with so just a notion of the nature of freedom as to regard it as a right of white women as well as of colored men.

The antislavery agitation, indeed, carried the woman question along with it in its progress. When its culmination was reached, the champions of the slave became, with few exceptions, the advocates of a freedom which should know no limits either of color or of sex. The exigencies of our Civil War brought numbers of our educated women into close and sympathetic relations with each other. They found themselves constrained to act in concert for the relief of the soldiers, for field and hospital service, and for the providing of necessary comforts for the sick and wounded. From this wider outlook the women never went back. The awful experience, too, of the war suggested to them many questions not to be answered by the old methods of reasoning. This terrible war took from many of them what they held dearest on earth — husbands, lovers, brothers, sons. Were they always to sit patiently beneath these heavy burdens of sorrow, imposed from without, with no consent of their own? Did not the question of war and peace concern them as deeply as it could concern the men of the country? It is scarcely necessary to rehearse here the great names which inscribed themselves under the new banner. They were names ever to be held in honor in our country's record, and they represented no half-hearted allegiance to the new reform. William Lloyd Garrison, Wendell Phillips, George William Curtis, Henry Ward Beecher,— let the opponents of woman suffrage

consider what these names meant to the community, what they still mean to history. Side by side with these brave men stood a young woman who argued the cause of her sex with a fresh charm and a new power. Lucy Stone, a farmer's daughter, had by long and patient labor enabled herself to acquire a college education. Gifted with a pleasing presence, a beautiful voice, and great force of conviction, she turned easily from the labors against slavery and intemperance, in which she won her early laurels, to the new advocacy which was destined to metamorphose the position of woman throughout the civilized world. In her husband she found a congenial and faithful helpmate. The pair, at first resident in New Jersey, transferred their household belongings to the neighborhood of Boston, from which point they unweariedly visited every part of New England, and much of the far West, pleading everywhere, with eloquent tongues, for the civil and political enfranchisement of women. Then arose pleadings which voiced the complaint of many hearts. Reason, the supreme authority, became convinced. Women said: "It is not right that men should be the sole arbiters of our fortunes. We, as well as they, are guardians of the community. We, with them, must have a voice in its affairs."

I had the happiness to become associated with these friends in their work, and to accompany them on many of their journeys. From these I reaped the benefit of an extended acquaintance with my own country and its people in various ranks of life. At intervals we made a thorough visitation of towns in New England, and especially in Massachusetts. We spoke oftenest in churches, but sometimes also in halls and schoolhouses. In the smaller places we held our meetings in the afternoon and evening, the women being too closely occupied with domestic matters to leave their homes in the forenoon. In the larger towns, teachers, factory hands, and school children formed part of our audience. Mrs. Livermore, then newly arrived from the West, was with us on these occasions, Colonel Higginson sometimes, Mr. Garrison often. I recall with pleasure a suffrage campaign which we made in the State of Vermont a score or more of years ago. The time was midwinter. As we whirled through the superb forests, the trees glittered as if every branch had been hung with diamonds. The air was crisp and exhilarating. We were the recipients of much simple hospitality, and our meetings were largely attended. Maine and New Hampshire also received us gladly. In the first named of these States farmers' wives sometimes drove 30 miles in an open wagon and in zero weather to hear our speakers. More than one of these confided to Mrs. Stone their sense of the dreariness of their lives, the sordid cares, the almost hopeless outlook, as the very home which they had worked hard to buy and to keep would in all probability be willed away from them by their husbands.

A very important part of the advance now noticeable in the legal position of women in Massachusetts is due to the legislative hearings which have been granted to the petitioners for woman suffrage during a long period of years. These hearings naturally were occupied by the prime matters of debate. At the same time the exposure made of the legal and economic injustice suffered by women did much to stimulate legislative action in their behalf. In the legal profession itself we had some important allies. One of the most efficient of these was the late Samuel E. Sewall, a man greatly beloved and honored in his day. This good friend devoted much time to the devising of bills for the amelioration of the legal condition of our sex. Among these I recall the following: A bill enabling a married woman to make a business contract with her husband; one allowing her to make such a will as she should see fit; one giving her a right to her own clothes; one securing to her the right to be buried in the burial lot of her deceased husband; a bill for the abolition of the widow's quarantine, *i. e.*, of the law which forbids her to remain more than 40 days in the house of her deceased husband without payment of rent, the right of the husband in corresponding circumstances being without legal limit. An important measure was brought before the Legislature of Massachusetts by the Home Club of East Boston, seconded by the New England Women's Club of Boston. This was a bill ordering that men who walk the streets of cities at night with evidently vicious purposes should be liable to arrest and penalty equally with women of like character and purpose.

I have often heard Mrs. Stone plead with great feeling for the right of married women to the equal guardianship of their children. I find upon examination that there are but eight States in the Union in which they enjoy this right, and that Massachusetts is not one of the eight. A very general interest was felt some years ago in Massachusetts regarding what is called the age of consent for young girls. This was first fixed in that State at 10 years: it has been gradually extended to 16 years, which limit was reached in 1893. While this was still a vexed question, I attended a hearing at the Boston State house in behalf of this very important change. Prominent among the speakers was the Rev. James Freeman Clarke, whose remarks were ably seconded by those of his daughter, Miss Lilian Clarke. Mr. Clarke argued that, since the law decided that a woman could not be held responsible for the management of her property before the age of 21 years, it could

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hardly be believed that the same law held her responsible at the age of 12 or 14 for matters which would decide her character and fate for life.

The band of suffragists who for many years have brought their own and kindred reforms before the legislators of Massachusetts have, on occasion, brought with them eminent lawyers of the other sex — the Hon. Samuel E. Sewall, George S. Hale, and others. It was a pleasant addition to our force when a pretty and well-dressed young lady, in full legal practice, came with us to a committee hearing at the Boston State house. On one such occasion several members of the committee expressed the opinion that we in our plea had overstated the undesirable features of the law under consideration. Miss ———, with sweet voice and charming modesty of manner, said: "Gentlemen, if you will look into volume — of the State statutes, page —, you will find that the matter stands as we have stated it." The volume was examined, and our statement was thereby confirmed.

Connecticut has the credit of having been the first State which gave to married women the power to make a will. This power the State conferred by act of Legislature in 1809. Ohio followed 26 years later, in 1835. In 1836 an endeavor was made by Ernestine L. Rose and Paulina Wright Davis to circulate in New York petitions for property rights for married women. They met with but little success, women and men alike deriding them. Mrs. Rose, however, addressed the Legislature of Michigan, asking for the political enfranchisement of women. This is said to have been the first address given by a woman before a legislature. In the same year Abraham Lincoln made a public declaration of his belief in the propriety of giving the franchise to women, an act which did not interfere with his election, some 24 years later, to the office of chief magistrate of the United States. In 1837 a National Female Antislavery Association held a convention in the city of New York. This appears to have been an entirely new departure for the sex. Angelina Grimké, a Southern lady, who had freed her own slaves, was mobbed in Independence Hall, Philadelphia, for speaking in public against slavery. The Grimké sisters became well known as advocates both of negro emancipation and of the political rights of their own sex. In their State they had enjoyed the consideration insured by fortune and position. When they entered upon their new mission at the North they became *anathema maran atha* to all save a few elect spirits. Their labors and those of Abby Kelley Foster and others in behalf of women soon began to bear fruit. In the years that followed, the public conscience became more and more exercised regarding the rights that women should enjoy in a free country. Legislative hearings in their behalf multiplied, and State after State relaxed the rigor of its exclusions.

In 1840 Texas gave married women the right to make a will. Alabama did likewise in 1843, Vermont in 1847. In 1848 the State of New York secured to its women the control of property. Pennsylvania added to this the power to make a will. In the same year was formed the first local suffrage association, at South Bristol, N. Y. In 1849 Virginia conceded to wives the right to make a will. Massachusetts gave both powers in 1855, Rhode Island in 1856, Maine in 1857, Wisconsin in 1859, Maryland in 1860. At the time of writing there remain only seven of our States in which women do not enjoy some control of their property.

It would seem that the leaven of a new faith had been working in the community from the early years of the 19th century. This leaven, as was natural, was generated in the minds of men and women eminent in the domain of literature and recognized as leaders in thought. In 1810 the Rev. Sydney Smith made, in the pages of the "Edinburgh Review," a witty and eloquent appeal for the better education of women. Margaret Fuller, who was born at about this time, devoted the fullness of her remarkable powers to the advocacy of human rights, and pleaded earnestly for the enlargement of education and opportunity for her own sex. In 1852 Mrs. Stowe, by the publication of "Uncle Tom's Cabin," placed herself in the forefront of the battle against slavery, and revealed to the reading public a power not previously recognized in her sex,— that of setting whole communities aflame with indignation against one form of tyranny. In 1854 Florence Nightingale's energetic services in the Crimean War shed a new luster on the annals of her sex In 1867 John Stuart Mill, eminent as a philosopher and political economist, pronounced in the English Parliament a memorable speech in favor of full suffrage for women.

To return briefly to the record of the States,— the vigorous young Territory of Wyoming at the first session of its legislature in 1869 granted full suffrage to women. When, 23 years later, the Territory was admitted to Statehood, its delegates insisted on maintaining in its constitution the right of women to suffrage, and, refusing to enter the Union on any other terms, carried their point. Municipal suffrage was granted to the women of Kansas by act of Legislature in 1887. Finally, but not, we hope, to conclude, Colorado in 1893, and Utah and Idaho in 1896, bestowed upon the women within their bounds suffrage full and equal to that exercised by men.

I must say a word here about the new power of eloquence displayed by women

when they became persuaded that they had a cause to plead. The walls of public buildings all the country over rang with their appeals for a better administration of justice, a fairer distribution of the functions of society. Mrs. Stanton, the Rev. Antoinette Brown, Susan B. Anthony, Mary A. Livermore, and other courageous women spoke in public for reform. Anna Dickinson electrified audiences with her stirring words. Frances Willard won great multitudes to the cause of temperance. Conventions and congresses of women were held, in which the burning questions of the day were discussed from the woman's point of view. Kansas, Wyoming, Iowa, Colorado, heard the new gospel of women's hope — heard and heeded.

The power of associated action among American women has been greatly promoted by an agency scarcely dreamed of 50 years ago,— that of the women's clubs. The time for these had come in the world's economy, and almost simultaneously in two of our leading cities appeared the New England Woman's Club of Boston and the New York Sorosis. Till that time the word "club" was commonly understood to indicate a place, more or less convenient and elegant, where the men could meet together for purposes of business, amusement, or friendly intercourse. The first women's clubs were started with the view of affording their members a more sympathetic and profitable communion than that conceded by fashion. The work of these clubs was to be the study of important social questions and the earnest endeavor to promote their true solution. Their recreations were to be furnished from the resources of art and literature. With several of these pioneer groups of students and workers I have had the honor to be closely associated. One of them, the Association for the Advancement of Women, originally founded by the New York Sorosis, devoted its energies to the holding of an annual congress of women in various parts of the Union. Wherever those meetings were held numbers of women, usually held apart by personal affairs, came together to welcome the pilgrims who had journeyed from afar. The congress lasted three days, and its sessions were devoted to the discussion of the most important and timely topics. The welcome given to its members, sometimes rather dull and tardy, always warmed into grateful praise. Helpful groups of workers everywhere sprang up in its tracks. When, more than a score of years after its beginning, Sorosis issued a call for a convention of women's clubs, a multitude appeared at her bidding, and a federation of women's clubs was formed which now binds together in amity the women of our whole domain, from Maine to Louisiana, from Massachusetts to California. The results of this wide extension of intercourse between different regions of our country can hardly be overestimated. Under its influence, sectional differences lose their unfriendliness of aspect, and sympathetic accord in the pursuit of worthy objects oversweeps and harmonizes all petty and personal discords.

In what I have already written I have characterized the apparently hopeless outlook of the sex which prevailed, let us say, till the middle of the 19th century. I have tried to illustrate the steps by which a helpless ward of the law has already become one of its active agents, sharing in some States the full responsibility of legislation. In the first half of the century there were some seven occupations open to women. The last report of the Commission of Labor enumerates 300 honest ways in which they may gain a livelihood. In the earlier period free speech was denied to women by the great power of public opinion. Today the honors and opportunities of the platform belong as fully to women as to their brothers. They are not only permitted, but urgently requested, to use their gift of eloquence in behalf of the most important questions which come before the mind of the community. The very thought of conceding to women a vote on any matter of public interest was derided as ridiculous and intolerable. They have now the right of school suffrage in 22 of our States. In four States full suffrage is secured to them; in one, municipal suffrage.

Though Massachusetts does not lead in the march of woman's political advancement, she has been a strong center of influence in the progress of the sex. She was first to concede to women the right not only of voting in the election of the school board, but also that of membership in that important body. The question of school suffrage was first brought forward in Boston by Abby W. May, and the New England Woman's Club, of which she was an officer, was the arena in which were heard the first arguments on the subject. In this same club, one of the earliest formed in the country, many matters of public interest were presented to the consideration of a wide circle of intelligent women. Dress reform, public sanitation, improved dwellings for working people, the beneficent providing of country and seaside outings for the children of the poor — these and other kindred topics were ably presented to the club, many of whose members became actively engaged in promoting the measures just spoken of.

The present state of things leaves us much to hope and work for, but the end, albeit not attained, is yet well in sight.

See SUFFRAGE, WOMAN: WOMEN'S RIGHTS.

JULIA WARD HOWE.

**Woman's Christian Temperance Union,** The National Woman's Christian Temperance Union was organized in Cleveland, O., in 1874, and is the sober second thought of the great woman's crusade. It is now regularly organized in the 45 States of the Union, and in every Territory. There are about 10,000 local unions, with a membership and following, including the children's societies, of about 500,000. The Woman's Christian Temperance Union has 40 distinct departments of work, presided over by as many women experts, in the National society, and in nearly every State. All the States in the Republic except one have laws requiring the study of scientific temperance in the public schools, and all these laws were secured by the Woman's Christian Temperance Union; also the laws forbidding the sale of tobacco to minors. The first police matrons and most industrial homes for girls were secured through the efforts of this society, as were the refuges for erring women. Laws raising the age of consent and providing for better protection for women and girls have been enacted by many Legislatures through the influence of the department for the promotion of social purity. The World's Woman's Christian Temperance Union was founded through the influence of Frances E. Willard in 1883, and already has auxiliaries in more than 40 countries and provinces. The white ribbon is the badge of all the Woman's Christian Temperance Union members, and is now a familiar emblem in every civilized country. The headquarters of the National organization is Rest Cottage, Evanston, Ill.

**Woman's College,** an educational institution for women in Baltimore, Md.; chartered in 1885; opened in 1888; under the auspices of the Methodist Episcopal Church; has productive funds exceeding $560,000; grounds and buildings valued at over $740,000; scientific apparatus, etc., $155,000; volumes in the library, about 12,000; average faculty, 28; average students, 350; graduates, over 850.

**Woman's Relief Corps,** an organization created by the mothers, wives, daughters, and sisters of Union soldiers of the Civil War of 1861–1865, for the purpose of aiding and assisting the Grand Army of the Republic, and to "perpetuate the memory of their heroic dead," to "extend needful aid to the widows and orphans," to "cherish and emulate the deeds of our army nurses," and to "inculcate lessons of patriotism and love of country among our children and in the communities in which we live." The organization is composed of departments, which are subdivided into corps, as well as detached corps in several States where no departments exist. On June 30, 1908, there were 2,866 corps and 161,646 members.

**Woman Suffrage,** See SUFFRAGE, WOMAN.

**Woman Worship,** excessive reverence paid to women. It is closely connected with the worship of female divinities, which probably is a development from Nature worship, in which the Earth was personified as a fruitful mother. Great reverence for women has always been a characteristic of the Teutonic nations, and was peculiarly prevalent in the ages of chivalry. Grimm gives some remarkable formulæ of chivalry ("by all women's honor," "for the sake of all women," etc.) in which this reverence is clearly shown.

**Wombat,** in zoölogy, *Phascolomys wombat*, a burrowing marsupial from Australia and Van Dieman's Land, and the islands of

HAIRY NOSED WOMBAT.

Bass' Strait. It is from two to three feet long, with a short tail; of clumsy form, with stout limbs and a blunt muzzle; coat thick, of long, coarse, brownish-gray, woolly hair; head large, flat, broad, with small eyes and ears; fore feet with five and hind feet with four digits; soles broad and naked. The dentition resembles that of the Rodentia, especially in the chisel-like incisors. The wombat is nocturnal in habit, a vegetable feeder, digging up roots with its claws. It is of small intelligence, but is gentle, and capable of domestication to a limited extent. It is hunted for its flesh which is highly esteemed, and is said to resemble pork.

**Woman, Higher Education of.** One of the most distinctive and far-reaching movements of the 19th century is that which has brought about the present large opportunities for the higher education of women. Confining itself to no country, this vast movement has advanced rapidly in some, slowly and timidly in others. In America three broad periods mark its progress: first, the period of quiescence, which ends about 1830; second, the period of agitation, ending with the Civil War; the third, though far as yet from completion, may be called the period of accomplishment.

For the first 200 years in the history of our country little importance was attached to the education of women, though, before the 19th century began, 24 colleges had

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been founded for the education of men. In the early years of this century private schools for girls were expensive and short-lived. The common schools were the only grades of public instruction open to young women. In the cities of Massachusetts, where more was done for the education of boys than elsewhere, girls were allowed to go to school only a small part of the year, and in some places could even then use the schoolroom only in the early hours of the day, or on those afternoons when the boys had a half-holiday. Anything like a careful training of girls was not yet thought of.

This comparative neglect of women is less to be wondered at when we remember that the colleges which existed at the beginning of the 19th century had been founded to fit men for the learned professions, chiefly for the ministry. Neither here nor elsewhere was it customary to give advanced education to boys destined for business. The country, too, was impoverished by the long struggle for independence. The government was bankrupt, unable to pay its veteran soldiers. Irritation and unrest were everywhere prevalent till the ending of the second war with England in 1815. Immediately succeeding this began that great migration to the West and Southwest which carried thousands of the most ambitious young men and women from the East to push our frontiers farther and farther into the wilderness. Even in the older parts of the country the population was widely scattered. The people lived for the most part in villages and on isolated farms. City life was uncommon. As late as 1840 only 9 per cent. of the population was living in cities of 8.000 or more inhabitants. Under such conditions nothing more than the bare necessities of education could be regarded.

But this very isolation bred a kind of equality. In district schools it became natural for boys and girls to study together and to receive the same instruction from teachers who were often young and enthusiastic. These were as a rule college students, granted long winter vacations from their own studies that they might earn money by teaching village schools. Thus most young women shared with their brothers the best elementary training the country afforded, while college education was reserved for the few young men who were preparing for the ministry or for some other learned profession.

From the beginning it had been the general custom of this country to educate boys and girls together up to the college age. Today in less than 6 per cent. of all our cities is there any separate provision of schools for boys and girls. This habitual early start together has made it natural for our men and women subsequently to read the same books, to have the same tastes and interests, and jointly to approve a large social freedom. On the whole, women have usually had more leisure than men for the cultivating of scholarly tastes.

The first endowment of the higher education of women in this country was made by the Moravians in the seminary for girls which they founded at Bethlehem, Pa., in 1749. They founded another girls' seminary at Lititz in 1794. Though both of these honorable foundations continue in effective operation today, their influence has been for the most part confined to the religious communion of their founders. In 1804 an academy with wider connections was founded at Bradford, Mass., at first open to boys and girls, since 1836 limited to girls. From that time academies and seminaries for girls increased rapidly. One of the most notable was Troy Seminary, founded by Emma Hart Willard and chartered in 1819. Miss Willard drew up broad and original plans for the higher education of girls, laid them before President Monroe, appealed to the New York Legislature for aid, and dreamed of establishing something like collegiate training. More than 300 students entered her famous seminary, and for 17 years she carried it on with growing reputation. Her address to the President in 1819 is still a strong statement of the importance to the republic of an enlightened and disciplined womanhood.

Even more influential were the life and work of Mary Lyon, who in 1837 founded Mount Holyoke Seminary, and labored for the education of women till her death in 1849. Of a strong religious nature, great courage and resource, she went up and down New England securing funds and pupils. Her rare gift of inspiring both men and women induced wide acceptance of her ideals of character and intelligence. Seminaries patterned after Mount Holyoke sprang up all over the land, and still remain as centers of powerful influence, particularly in the middle West and on the Pacific coast.

With this development, through the endowment of many excellent seminaries, of the primary education of girls into something like secondary or high school opportunities, the period of quiescence comes to an end. There follows a period of agitation when the full privilege of college training side by side with men was demanded for women. This agitation was closely connected on the one hand with the antislavery movement and the general passion for moral reform at that time current; and, on the other, with the interest in teaching and that study of its methods which Horace Mann fostered. From 1830 to 1865 it was becoming evident that women were destined to have a large share in the instruction of children. For this work they sought to fit themselves, and the reformers aided them.

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Oberlin College, which began as a collegiate institute in 1833, was in 1850 chartered as a college. From the beginning it admitted women, and in 1841 three women took its diploma. Antioch College, under Horace Mann's leadership, opened in 1853, admitting women on equal terms with men. In 1855 Elmira College was founded, the first institution chartered as a separate college for women.

Even before the Civil War the commercial interests of the country had become so much extended that trade was rising into a dignity comparable to that of the learned professions. Men were more and more deserting teaching for the business life, and their places, at first chiefly in the lower grades, were being filled by women. During the five years of the war this supersession of men by women teachers advanced rapidly. It has since acquired such impetus that at present more than two-thirds of the training of the young of both sexes below the college grade has fallen out of the hands of men. In the meantime, too, though in smaller numbers, women have invaded the other professions and have even entered into trade. These demonstrations of a previously unsuspected capacity have been both the cause and the effect of enlarged opportunities for mental equipment. The last 30 or 40 years have seen the opening of that new era in women's education which I have ventured to call the period of accomplishment.

From the middle of the century the movement to open the State universities to women, to found colleges for men and women on equal terms, and to establish independent colleges for women spread rapidly. From their first organization the State universities of Utah (1850), Iowa (1856), Washington, (1862), Kansas (1866), Minnesota (1868), Nebraska (1871), admitted women. Indiana, founded in 1820, opened its doors to women in 1868, and was followed in 1870 by Michigan, at that time the largest and far the most influential of all the State universities. From that time the movement became general; the example of Michigan was followed till at the present time all the colleges and universities of the West, excepting those under Catholic management, are open to women. The only State university in the East, that of Maine, admitted women in 1872. Virginia, Georgia, and Louisiana alone among all the State universities of the country remain closed to women.

This sudden opening to women of practically all universities supported by public funds is not more extraordinary than the immense endowments which during the same period have been put into independent colleges for women, or into colleges which admit men and women on equal terms. Of these privately endowed colleges, Cornell, originally founded for men, led the way in 1872 in opening its doors to women. The West and South followed rapidly, the East more slowly. Of the 480 colleges which at the end of the century are reported by the Bureau of Education, 336 admit women; or, excluding the Catholic colleges, 80 per cent. of all are open to women. Of the 60 leading colleges in the United States there are only 10 in which women are not admitted to some department. These 10 are all on the Atlantic seaboard and are all old foundations.

This substantial accomplishment during the last 40 years of the right of women to a college education has not, however, resulted in fixing a single type of college in which that education shall be obtained. On the contrary, three clearly contrasted types now exist side by side. These are the independent college, the coeducational college, and the affiliated college.

To the independent college for women men are not admitted, though the grade, the organization, and the general aim are supposed to be the same as in the colleges exclusively for men. The first college of this type, Elmira (1855), has been already mentioned. The four largest women's colleges — Vassar, opened in 1861; Smith, in 1875; Wellesley, in 1875, and Bryn Mawr, in 1885 — take rank among the 60 leading colleges of the country in wealth, equipment, teachers and students, and variety of studies offered. Wells College, chartered as a college in 1870, the Woman's College of Baltimore, opened in 1888, and Mt. Holyoke, reorganized as a college in 1893, have also large endowments and attendance. All the women's colleges are empowered to confer the same degrees as are given in the men's colleges.

The development of coeducation, the prevailing type of education in the United States for both men and women, has already been sufficiently described. In coeducational colleges men and women have the same instructors, recite in the same classes, and enjoy the same freedom in choice of studies. To the faculties of these colleges women are occasionally appointed, and, like their male colleagues, teach mixed classes of men and women. Many coeducational colleges are without halls of residence. Where these exist, special buildings are assigned to the women students.

The affiliated colleges, while exclusively for women, are closely connected with strong colleges for men, whose equipment and opportunities they are expected in some degree to share. At present there are five such: Radcliffe College, the originator of this type, connected with Harvard University, and opened in 1879; Sophie Newcomb Memorial College at Tulane University, opened in 1886; the College for Women of Western Reserve University, 1888; Barnard College at Columbia University, 1889; the Women's

College of Brown University, 1892. In all these colleges the standards for entrance and graduation are the same as those exacted from men in the universities with which they are affiliated. To a considerable extent the instructors also are the same.

During the last quarter-century many professional schools have beeen opened to women,—schools of theology, law, medicine, dentistry, pharmacy, technology, agriculture. The number of women entering these professions is rapidly increasing. Since 1890 the increase of women students in medicine is 64 per cent., in dentistry 205 per cent., in pharmacy 190 per cent., in technology and agriculture 194 per cent.

While this great advance has been accomplished in America, women in England and on the Continent, especially during the last 30 years, have been demanding better education. Though much more slowly and in fewer numbers than in this country, they have everywhere succeeded in securing decided advantages. No country now refuses them a share in liberal study, in the instruction of young children, and in the profession of medicine. As might be expected, English speaking women, far more than others, have won and used the opportunities of university training. Since 1869 women have been studying at Cambridge, England, and since 1879 at Oxford. At these ancient seats of learning they have now every privilege except the formal degree. To all other English and Scotch universities, and to the universities of the British colonies, women are admitted, and from them they receive degrees.

In the most N. countries of Europe —in Iceland, Finland, Norway, Sweden, Denmark,—the high schools and universities are freely open to women. In Eastern Europe able women have made efforts to secure advanced study, and these efforts have been most persistent in Russia and since the Crimean War. When denied in their own land, Russian women have flocked to the Swiss and French universities, and have even gone in considerable numbers to Finland and to Italy. Now Russia is slowly responding to its women's entreaties. During the last 10 years the universities of Rumania, Bulgaria, Hungary, and Greece have been open to women; while in Constantinople the American College for Girls offers the women of the East the systematic training of the New England type of college. In Western, Central, and Southern Europe all university doors are open. In these countries degrees and honors may everywhere be had by women, except in Germany and Austria. Even here, by special permission of the Minister of Education, or the professor in charge, women may hear lectures. Each year, too, more women are granted degrees by special vote and as exceptional cases.

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In brief, it may be said that practically all European universities are now open to women. No American woman of scholarship, properly qualified for the work she undertakes, need fear refusal if she seeks the instruction of the greatest European scholars in her chosen field. Each year American women are taking with distinction the highest university degrees of the Continent. To aid them, many fellowships and graduate scholarships, ranging in value from $300 to $1,000 dollars, are offered for foreign study by our colleges for women and by private associations of women who seek to promote scholarship. Large numbers of ambitious young women who are preparing themselves for teaching or for the higher fields of scientific research annually compete for this aid. Three years ago an association was formed for maintaining an American woman's table in the Zoölogical Station at Naples. By paying $500 a year they are thus able to grant to selected students the most favorable conditions for biological investigation. This association has also just offered a prize of $1,000, to be granted two years hence, for the best piece of original scientific work done in the meantime by a woman. The American Schools of Classical Studies in Athens and Rome admit women on the same terms as men, and award their fellowships to men and women indifferently. One of these fellowships, amounting to $1,000 a year, has just been won by a woman.

The experience, then, of the last 30 years shows a condition of women's education undreamed of at the beginning of the century. It shows that though still hampered here and there by timorous restrictions, women are in substantial possession of much the same opportunities as are available for men. It shows that they have both the capacity and the desire for college training, that they can make profitable and approved use of it when obtained, and that they are eager for that broader and more original study after college work is over which is at once the most novel and the most glorious feature of university education today. Indeed, women have taken more than their due proportion of the prizes, honors, and fellowships which have been accessible to them on the same terms as to men. Their resort to institutions of higher learning has increased far more than that of men. In 1872 the total number of college students in each 1,000,000 of population was 590. Last year it had risen to 1,270, much more than doubling in 27 years. During this time the number of men had risen from 540 to 947, or had not quite doubled. The women rose from 50 in 1872 to 323 in 1899, having increased their former proportional number more than six times, and this advance has also been maintained in graduate and professional schools.

The immensity of the change which the last century has wrought in women's education may best be seen by setting side by side the conditions at its beginning and at its close. In 1800 no colleges for women existed, and only two endowed schools for girls,— these belonging to a small German sect. They had no high schools and the best grammar schools in cities were open to them only under restrictions. The commoner grammar and district schools, and an occasional private school dedicated to "accomplishments," were their only avenues to learning. There was little hostility to their education, since it was generally assumed by men and by themselves that intellectual matters did not concern them. No profession was open to them, not even that of teaching, and only seven possible trades and occupations.

In 1900 a third of all the college students in the United States were women. Sixty per cent. of the pupils in the secondary schools, both public and private, were girls — *i. e.*, more girls were preparing for college than boys. Women having in general more leisure than men, there is reason to expect that there will soon be more women than men in our colleges and graduate schools. The time, too, has passed when girls went to college to prepare themselves solely for teaching or for other bread-winning occupations. In considerable numbers they now seek intellectual resources and the enrichment of their private lives. Thus far between 50 and 60 per cent. of women college graduates have at some time taught. In the country at large more than 70 per cent. of the teaching is done by women; in the North Atlantic portion over 80 per cent. Even in the secondary schools, public and private, more women than men are teaching, though in all other countries the advanced instruction of boys is exclusively in the hands of men. Never before has a nation intrusted all the school training of the vast majority of its future population, men as well as women, to women alone. Merely to meet successfully this tremendous venture nothing less than the vast extension which women's education has undergone in our time could suffice.

ALICE FREEMAN PALMER.

**Women in the Industries and Professions.** At the opening of the 19th century the position of women, as prescribed by law and custom of the civilized world, was that of complete tutelage to fathers, husbands, and sons. The rehearsal of the laws of the period conveys but slight information concerning the limitations imposed on women, for the unwritten laws of public opinion were often quite as binding; yet clearly to comprehend the significance of the changes in the position of women which have been wrought in the 19th century it is necessary to understand the point of departure.

In 1800 the spinster over age and the widow were free by law to collect their own wages and to control their own property, but popular opinion restricted this right. The nearest male relative usually managed the property of such women, and the custom was so thoroughly established that few women dared to become the exception to it. The opinion was likewise widespread and emphatic that no man of pride and resources would permit his womenfolk to labor for money, and the natural corollary of that opinion was another — that the woman who labored for wages was to be pitied as an unfortunate or disapproved as an eccentric. In consequence, many women whose freedom from family cares and natural instincts urged them to enter the field of labor ate the bread of dependence rather than face the condemnation of society. The fact that food and clothing were almost wholly prepared within the home rendered this condition possible and bearable, since such useful and necessary employment was furnished that the dependent relative could more than pay for her keeping by the value of the services she rendered. Women driven by necessity into the world's workshop found few occupations open to their hands, and these so poorly compensated as to offer little more than a bare subsistence. The paid work of women outside was necessarily pitted against the unpaid work of women within the home; while the unrecognized commercial value of both tended to strengthen the opinion generally adopted that women's work was always of an inferior quality.

When Harriet Martineau visited the United States in 1840, she reported having found only seven occupations open to women — teaching, needlework, keeping boarders, working in cotton factories, typesetting, bookbinding, and household service. Of these employments, teaching indicated the highest mental acquirements, but at that date women teachers were confined almost entirely to the primary departments of city schools and to summer terms in country districts. The lack of opportunities for higher education prevented their fitness for the highest positions, and the popular idea of their general incompetency prevented the full recognition of the qualifications they did possess. A dollar a week with "boarding around" was accounted good wages for a woman teacher.

The economic development of the country was the unconscious influence which brought better industrial conditions to women. The establishment of factories gradually removed the manufacture of cloth and clothing from the home. The necessary purchase of these necessities demanded a greater cash income for the family. The man who had supported a family of women when it required but

small outlay of money, found himself unable to do so when every comfort demanded a cash investment. The necessities of poverty drove women into the wage-earning occupations, while the changed economic conditions gradually lifted the ban placed on the woman worker. Meanwhile, the prejudice against education for women was being slowly eradicated and better opportunities were offered for their intellectual development. With higher qualifications there came the demand for better-paid employments and the gradual opening of new occupations followed.

The real contest centered about the three learned professions, since the opposition there combined the prejudice against the woman worker, the prejudice against financial independence for women, and the skepticism concerning woman's intellectual ability. This portion of the history of the industrial evolution of women offers the truest measure of changed conditions. In the early years of the century the higher vocations were entirely beyond the reach of women. Three distinct and overpowering obstacles stood in the way:

(1) The belief, practically universal, that the minds of women were wholly incapable of mastering a college education, and still less the training required by a learned profession; and that their physical strength was insufficient to endure the strain of so long a period of close study. (Oberlin College was opened in 1833, but no women were graduated till 1841.)

(2) The belief, quite as universal, that if a woman shoud receive the necessary professional training, no patrons would reward her, and her preparation in consequence would represent a loss of time and money.

(3) The popular belief that any woman who would seek to enter a profession must of necessity be masculine, "unsexed," indelicate, and unworthy of public esteem.

The first profession opened to women was medicine. The first graduated woman physician was Dr. Elizabeth Blackwell. She was born in England, but had removed at an early age with her family to America. She was a woman of clear intellect, austere character, and resolute courage. She was poor, and no friend stood ready to supply the necessary funds to secure the required training. Nothing daunted, she began teaching, and by dint of constant energy and close economy for a period of years she saved a sum accounted sufficient for a beginning. Meanwhile she had sought advice and counsel of many physicians. Many condemned her ambition as unsuitable and unwomanly, a few wished her well, but none had definite counsel to offer. Arrangements were finally made whereby she might study in the office of a physician. Afterward she made application for admission to different medical schools, but the invariable answer

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was a peremptory refusal. A professor of surgery in the largest college in Philadelphia, who was favorable to Miss Blackwell's enterprise, offered to admit her to his classes if she would disguise herself in the attire of a man. Still another friend advised her to don male attire and go to Paris for study; but neither proposition tempted her. In her own words: "It was, to my mind, a moral crusade on which I had entered, a course of justice and common sense, and it must be pursued in the light of day and with public sanction in order to accomplish its end."

Among the colleges to which she sought admission was one at Geneva, N. Y. The faculty passed upon her request and concluded not to admit her, but wishing to escape the full responsibility of a refusal decided to leave the matter in the hands of the class, with the understanding that if a single student objected she should be excluded. In the words of a member of the class and an eyewitness.

"Contrary to all expectations, the whole affair assumed the most ludicrous aspect to the class, and the announcement was received with the most uproarious demonstrations of favor. A meeting was called for the evening, and every member attended. The resolution approving the admission of the lady was sustained by a number of extravagant speeches which were enthusiastically cheered. The vote was finally taken with what seemed to be one unanimous yell, 'Yea!' When the negative vote was called, a single voice was heard uttering a timid 'No!' The scene that followed passes description. A general rush was made for the corner of the room which emitted the voice, and the recalcitrant member was only too glad to acknowledge his error, and record his vote in the affirmative."

The faculty received the decision of the class with evident disfavor, but were compelled to return an answer admitting the applicant. It appeared later that some of the students considered the application a hoax perpetrated by a rival institution.

However, when Miss Blackwell appeared, her fellow students conducted themselves with entire decorum and respect. She entered in 1847 and graduated in January, 1849. The president of the college pronounced her the leader of her class and stated that she had passed through a thorough course in every department. Her graduation made a profound impression on the public. The press received the news of a woman graduate in medicine with varying comments. Many writers displayed their bitter disapproval, a few gave words of cheer, but the majority treated it as a joke. After graduation, she pursued additional studies abroad. In 1850, after repeated endeavors to gain admission to St. Bartholomew's Hospital, she was admitted with the information that every department would be open to her "except the department for female diseases." Dr. Blackwell returned to America and began to practise in New York in 1851. She reports the first seven years

as difficult and discouraging. In her own words: "I had no medical companionship, the profession stood aloof, and society was distrustful of the innovation. Insolent letters occasionally came by post and my pecuniary position was a source of constant anxiety."

In 1854 Emily Blackwell, a sister of Elizabeth, graduated from the Medical College of Cleveland and continued her studies in Paris. Maria E. Zackrewska, a young German woman who had begun her studies in her own country by the advice of a prominent university professor, came to America to find opportunity to complete them. This she did at the Cleveland college. These three women established a hospital in New York in 1857. The attempt met with much opposition and the promoters were assured "that no one would let a house for the purpose; that 'female doctors' would be looked upon with suspicion; that the police would interfere; that if deaths occurred their death certificates would not be recognized; that it would be resorted to by classes and persons whom it would be an insult to be called upon to deal with; that without men as resident physicians they would not be able to control the patients; that if any accident occurred, not only the medical profession, but the public, would blame the trustees for supporting such an undertaking; and, finally, that they would never be able to collect money enough for so unpopular an effort."

No obstacle had been so serious as the one which now faced these three courageous women. Unfortunately, though women had been excluded from medical schools, there had been occasional women who took the title of "doctress" for the purpose of a criminal but profitable practice. Not only had the first women physicians to battle against the prejudices of society, but they were forced to contend against the suspicion that the woman practitioner was a disguised criminal. Perhaps nothing could more clearly demonstrate the effect of this belief than an incident related by Dr. Elizabeth Blackwell. She had called upon Fanny Kemble, who was giving a series of Shakespearian readings in New York, often in aid of struggling institutions. The actress listened courteously till she heard that the physicians of the institution seeking her support were women, when "she sprang up to her full height, turned her flashing eyes on us, and with the deepest tragic tones of her magnificent voice, exclaimed: 'Trust a woman — as a doctor! never!'" The difficulty, however, was overcome and the Infirmary for Women and Children was established, where thorough training for female nurses was given.

Various female medical colleges opened meantime and a number of women availed themselves of the opportunities thus offered. Among these were colleges in Boston, New York, and Philadelphia, each sanctioned by the legislatures of their respective States. These colleges, however, owing to public opposition and a meager attendance did not

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reach the high standard maintained by the best colleges for men. Many women graduating from them were forced to go to Paris, London, or Switzerland for the opportunities of advanced study which were denied by American colleges. The difficulties which hindered the practice of those early women physicians almost passes belief. In Philadelphia in 1850 Dr. Hannah Longshore opened an office, only to find that the men physicians were in league against her and that at their request the druggists of the city refused to sell drugs to her, hoping by such action to drive her from the city. In many States women were denied admission to medical societies and many physicians refused to consult with them.

In 1861 the study of surgery and dentistry was opened to women in Sweden and in 1863 the University of Zurich opened all its departments, including medicine, to women. In 1865 Miss Elizabeth Garrett received the first medical diploma granted to a woman in England. In 1869 women were admitted to the academic departments of the University of Michigan, and a few years later they were admitted to the medical department.

For many years medical practice of a desirable kind was difficult for women physicians to secure. Patients came at first chiefly from the poor. Women who should, according to theory, have been the best patrons of their pioneer sisters, were influenced by popular opinion and offered neither support nor encouragement. The prejudice which was overwhelming in 1840 has not been entirely eliminated; yet at the close of the century women were admitted to the medical societies of the United States and England, were accepted in consultation with men physicians, and the practice of many of them is now large, successful, and lucrative. At the close of the century there were in the United States and Canada 49 medical colleges admitting women, nine being separate women's schools. Seven hundred graduated women physicians were reported as practising in Russia, several hundred were practising in the British empire and colonies. There are women physicians in all countries of Europe, in China, Japan, Persia, India, and Egypt; and it is estimated that some 10,000 graduated women physicians are practising in the United States.

In 1850 Antoinette Brown was graduated from Oberlin and immediately made application to enter the theological department. The president did his utmost to dissuade her, but failing in this he was forced to admit her, owing to the exceedingly liberal character of the college charter. She pursued the entire course, and, despite the fact that faculty and trustees continued their disapproval of her presence there, was graduated with honor in 1853. However, to guard against further applicants the Ober-

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lin charter was so amended as to prevent other women from entering the theological school, and her name was not printed in the list of graduates till 40 years after her graduation. Miss Brown was shortly after her graduation ordained by a Congregational Church in New Jersey. At about the same date the Universalist Church ordained the Rev. Olympia Brown. Some denominations did not require a diploma from a theological school as a qualification, and on that account offered easier means of entrance than others; but this advantage, open to men, offered no encouragement to women, since it was offset by the overpowering belief that the ministry of women was contrary to God's Word. There are now some 18 denominations, including Friends and the Salvation Army (which do not require ordination), that permit women to preach. Several hundred women are occupying regular pulpits. Those churches whose government is determined by large representative bodies, such as the Methodist Episcopal Conference and the Presbyterian Assembly, have never granted ordination to women. The denominations in which ordination may be secured at the request of a single congregation are those in which women ministers are most numerous. The so-called liberal denominations — Unitarian and Universalist — have ordained the largest number of women in proportion to their total membership. Among the churches which have ordained women are the Unitarian, Universalist, Congregational, Baptist, Free Baptist, Methodist Protestant, Free Methodist, Christian, and United Brethren.

The law was the last profession to admit women, and it will doubtless be the last to concede fair opportunity. Yet the opposition is disappearing, the number of women lawyers is increasing, and sooner or later the law, too, will unquestionably offer equal chances to women. Permission to practise law in nearly all countries can be obtained only by decree of a court. In several States courts threw off the responsibility of passing on the application of women candidates by the decision that a special act of the Legislature must first be secured, making women eligible to the profession of law. In 1869 Belle Mansfield was admitted to the bar in Iowa; that same year Myra Bradwell made application for admission to the bar in Illinois and was refused. She appealed to the Supreme Court of the United States which decided that each State must determine the question for itself. Several women are now practising law in Illinois and many other States have admitted them to practise; but in each State a special effort had to be made to secure the right for the first candidate. Western States presented little difficulty, but Eastern States withheld the privilege longer. Several hundred women have since been graduated from law schools and many are engaged in honorable and lucrative practice. Women have been graduated in law in several foreign countries, but though efforts to secure admission to the bar have been made in Italy, Belgium, Switzerland, and Russia, they have thus far been in vain.

Though woman in the "learned professions" still has difficulties to overcome in addition to those which confront man, it is evident that these are growing fewer every year. Basing one's judgment on the rapidity with which conditions have changed in the last 50 years, a prophecy may be ventured with safety that in a few years the professional woman and professional man will stand before the world with equal chances of success or failure. The constantly increasing demand of women for work, the gradual decrease of prejudice against the woman worker, and the improved standard of qualification have opened nearly all occupations to women, and all the professions, learned and otherwise, within the last 50 years.

No occupation illustrates more clearly the immensity of the changes wrought than teaching. As early as 1789 women were beginning to teach in country districts in the summer months when the schools were small and mainly confined to girls. The wages were much below those paid to men, even for summer schools, while winter schools attended by boys were considered quite beyond the capacity of women. The change of opinion has been slow but decided. In some States four-fifths of the teachers are women, while for the whole United States more than half the teachers are women. Most Southern States still employ more men than women teachers, but Northern and Western States employ more women than men. In 1880 there were 100,000 women teachers in the public schools of the United States; in 1890, 236,912. The highest positions are usually reserved for men, and there is still unequal pay for equal work in most States. Many professorships in colleges and universities, representing every phase of scholarship, from ancient languages to modern science, and from literature to engineering, are held by women. The profession of teacher is also open to women in foreign countries, though they are mainly confined to positions in primary and intermediate schools. There, as in the United States, teaching was the first profession to admit women. The universities of Sweden, Italy, and Switzerland, have employed women in responsible positions as instructors.

During the century there has been a marvelous growth of manufactures in the United States, and women as well as men have reaped the advantage. The censuses for 1880 and 1890 name 388 distinct occupations, exclusive of clerkships, in connec-

tion with manufactures, and women are reported to be employed in 371 of these. It is interesting to note the manufactures where no women have as yet been employed: Foundry supplies, artificial fuel, grindstones, horseshoes, iron and steel doors and shutters, lard oil, neatsfoot oil, resin oil, racking hose, beet sugar, zinc, and preserving wood. In the various industries 846,614 women are employed, as compared with 3,745,123 men. The number of women reported in the census of 1880 as engaged in gainful occupations was 2,647,157; in 1890, 3,914,571, and it is probable that the census of 1900 will report 5,000,000 so engaged. In 1880, 14.69 per cent. of the total female population was engaged in gainful occupations; in 1890, 16.97 per cent., or a little more than one woman in six.

Victor Hugo predicted that the 19th century would be known as Woman's Century. The comparison of the woman of 1800 with the woman of 1900 offers abundant proof of the correctness of the prophecy.

CAROLINE C. CATT.

**Women, National Council of,** in the United States a central council of women, to which all National societies organized for any purpose whatsoever come to hear what other National societies are doing on other lines. They counsel together as to any reform, or movement, in which all might coöperate. The council has a cabinet, and is fashioned on a plan similar to the Senate of the United States. It is self-supporting, with the aid of patrons. Twenty National societies are represented in the council; they aggregate a membership of 1,200,000 women, the largest representative organization in the world. It is affiliated with the International Council of Women.

**Women's Clubs, General Federation of,** in the United States, an organization incorporated in 1892, and composed of over 2,675 women's clubs, having a membership of 155,000 women in the United States and foreign countries. The purpose of the Federation is declared in its articles of incorporation to be "to bring into communication with one another the various women's clubs throughout the world, that they may compare methods of work and become mutually helpful. Constitutions of clubs applying for membership should show that no sectarianism or political test is required, and, while the distinctively humanitarian movements may be recognized, their chief purpose is not philanthropic or technical, but social, literary, artistic, or scientific culture." Meetings of the federation are held biennially. There are 37 State federations auxiliary to the General Federation, and 683 single clubs in 41 States. Several clubs auxiliary to the general federation, — the Pioneer Club of London, Woman's Club of Bombay, and Educational Club of Ceylon, clubs in Australia, South America, etc.

**Women's Rights,** the name given to the claims advanced on behalf of women who demand that their sex shall, as far as possible, be put on a footing of legal and social equality with men. The agitation for women's rights dates from 1851, and was the result of an article on the subject in the "Westminster Review" of that year by John Stuart Mill. Women claim the right to vote at all political elections on the ground that, when householders, they pay rates and taxes, and therefore ought not to be denied a voice in deciding how local and imperial revenues should be spent. They also desire to share with men all the educational endowments of the country — to enter suitable trades and professions on the same terms as men — to change the laws of marriage and divorce, in the making of which they have no voice, and which, they contend, press with unequal severity on them. In several of the States of the Union women vote, and in one at least they are on the same footing as men politically. In England women possess the municipal but not the parliamentary franchise, and there is a general tendency in America and Europe to admit women to some, if not all, of the benefits of university education, and to the practice of medicine. See SUFFRAGE, WOMAN.

**Wonder Flower,** a popular name in Teutonic folk tales for a flower endowed with miraculous power, especially with regard to the discovery of buried treasure. Grimm thinks that the name forget-me-not applied to the Germander speedwell and Myosotis has reference to this supposed miraculous power, and that the "sentimental" explanation came later. He says:

> "The folk tales simply call it a beautiful wonderflower, which the favored person finds and sticks in his hat; all at once entrance and exit stand open for him to the treasure of the mountain. If inside the cavern he has filled his pockets, and, bewildered at the sight of the valuables, had laid aside his hat, a warning voice rings in his ear as he departs, Forget not the best! . . . In a twinkling all has disappeared, and the road is never to be found again."

**Wood,** in a botanical sense, the hard, solid, non-succulent stem of any plant, and in a chemical sense, lignin, a hardened form of cellulose, the principal constiuent of all vegetable life, with a small proportion of resinous and incrusting matter. Wood thus only differs from vegetable fibers — cotton, flax, hemp, etc.— in its physical condition. Woody stems are divided into two great classes, according to the manner in which they grow. The first and most important class is the exogens or exogenous stems, so called on account of the annual increments being added on the outside of the stem just within the bark, and the

layers of growth are seen in such stems in a series of concentric circles, each ring of which represents the growth of one year. This class embraces all the trees of temperate climates, and, indeed, the greater part of all tree life. The second class — endogenous stems — shows no rings of annual growth, but a cross section exhibits a series of dark spots, more or less closely studded, and always more densely packed toward the outer circumference.

There is no proper distinction of bark and wood; increase of size takes place by pressure from the center outward, and the outer portions of the stem are always hardest and most compact. The principal representatives of endogenous woody stems are the palm trees and the bamboos, but though these are largely used for structural and other applications of wood, especially in the countries of their production, they are not to be compared for general utility with exogenous stems. The spurious stems of acrogens (tree ferns) have no place as sources of wood. In an exogenous stem the wood is divided into an outer sap-wood or albumen portion and an inner heart-wood or duramen part. As a rule, it is only the heart-wood of a tree that is useful for the ordinary purposes of wood, and the rate at which the sap-wood turns into heart-wood varies much in different species of tree. All kinds of wood are subject to many defects, which decrease their usefulness for building and other purposes. The principal defects are known as "shakes"— a heart shake consisting of clefts or fissures running through the center of the wood across the pith; cup shakes radiate from the center or go round the lines of annual growth. Knots and warpings are also common defects, the former being especially characteristic of several kinds of pine wood.

For trade purposes wood is classified under two heads, as soft wood and hard wood, the leading representatives of the former being the numerous varieties of pine, and the latter embracing the oaks, beeches, ash, birch, and furniture woods generally. Dye woods form a class by themselves, and belong to a quite distinct trade. Wood before it can be properly used for any structural purposes, must be seasoned by some means of drying, so as to withdraw the vegetable sap from it. The common and best way of seasoning is to stack the wood in the open air, but this process is tedious, especially with large logs and hard wood. Submergence in water for some time hastens the seasoning operation, and steaming or boiling also renders wood quickly fit for employment, though it weakens the timber. A process of desiccation in heated chambers is practised for the seasoning of thin planks and boards used by joiners and cabinetmakers, but such rapid seasoning is very ready to cause a splitting and warping of the wood.

Partly to season and partly also to increase the durability of wood in certain very exposed situations, various ways of treating timber with preserving agents are employed. One process, largely used for railway sleepers and similar purposes, consists in impregnating the wood under strong pressure with creosote or impure carbolic acid. Bennett's process has also been extensively used, especially on the Continent. It consists in impregnating the wood under pressure with chloride of zinc. Kyanizing consists in treating the wood with Kyan's preserving fluid, a solution of the bichloride of mercury. It is a process little used in England. Boucheri's process, which has been adopted to some extent in France, consists in causing the tree trunk to absorb a preservative solution — acetate of copper or acetate of iron — through its roots in the same way as it takes up and circulates sap while in life. The tree is felled and the root end is dipped in the proper solution, which then is carried through the trunk and supplants the ordinary sap. The process is not so well adapted for firs, oaks, ashes, and poplars as for such trees as the lime, beech, willow, alder, and elm. There are several other preservative processes and solutions which have been brought forward but little used. Besides its multifarious applications as timber in engineering, shipbuilding, carpentry, and cabinetmaking, wood has numerous important minor uses. It is a most valuable fuel, and the source of wood tar, pyroligneous acid, wood naphtha, and charcoal; and certain kinds of wood are now extensively pulped for employment in paper-making.

**Wood, Sir Andrew,** a British naval officer; born probably at the Old Kirkton of Largo in Fife, Scotland, about the middle of the 15th century. Originally a merchant trader of Leith, he learned the art of naval warfare by frequent encounters with pirates in defense of his ships and merchandise. James III. often employed him. In 1481 he defeated an English squadron on the Firth of Forth, and in the same year gallantly defended Dumbarton against the fleet of Edward IV. His two ships, "The Flower" and "The Yellow Carvel" (each about 300 tons), made frequent voyages to the Dutch and Hanse towns, exchanging "the wool and hides" of Scotland for "the mercery and haberdashery ware" of the Continent. In 1482 he received knighthood as a reward of his services and the lands and village of Largo in fee. Wood was strongly opposed to the rebellion of the nobles against James III., kept close by in the Forth with his ships while the battle of Sauchieburn was going on, and for some time after the murder of the king refused

to acknowledge the new government. In 1489, however, the appearance of a piratical English squadron in the Firth of Forth induced him, on the urgent solicitation of James IV., to place his services at the disposal of that monarch. He engaged the enemy off Dunbar, and captured every ship. On Aug. 10–11, 1490, off the Isle of May, he won a brilliant victory over a skillful English commander, Stephen Bull, whom he carried with his three ships into the port of Dundee. Fresh honors and gifts followed these achievements. In 1503 Wood was employed to chastise the rebels in the Hebrides. In 1511 he was put in temporary command of the "Great Michael," built by James for the protection of Scotch commerce, and deemed the strongest ship then afloat. After Flodden he was sent to France to invite the Duke of Albany to accept the regency. There is a story that he had a canal cut from his house in Largo down to the parish church, and that he used to sail thither in his barge every Sunday. He died about 1540.

**Wood, Anthony,** called ANTHONY À WOOD, an English antiquary; born in Oxford, England, Dec. 17, 1632; spent most of his life in collecting data relating to the history of Oxford University. He wrote: "History and Antiquities of the University of Oxford"; "An Exact History of all the Writers and Bishops who have had their Education in the University of Oxford, from 1500 to 1690"; "Modus Salium: A Collection of Pieces of Humor" (1751); and "The Ancient and Present State of the City of Oxford" (1773). He died in Oxford, Nov. 28, 1695.

**Wood, Charlotte Dunning,** pen name, CHARLOTTE DUNNING, an American novelist; born in Poughkeepsie, N. Y., in 1858. Her works include: "Upon a Cast" (1885); "Cabin and Gondola" (1886); "A Step Aside" (1886).

**Wood, Edward Stickney,** an American chemist; born in Cambridge, Mass., April 28, 1846; was graduated at the Medical Department of Harvard University in 1867; studied medicine and chemistry in Europe; and was appointed Professor of Chemistry at the Medical Department of Harvard University in 1876. His publications include a translation of Neubauer and Vogel's "Analysis of Urine" (1879); "Examination of Blood and Other Stains"; "Examination of Hair"; "Arsenic as a Domestic Poison"; etc. He died in 1905.

**Wood, Ellen Price** (MRS. HENRY WOOD), an English novelist; born in Worcester, England, Jan. 17, 1814. She edited the "Argosy" in 1867; and published many novels, among which are: "East Lynne" (1861); "The Channings" (1862); "The Shadow of Ashlydyat" and "Verner's Pride" (1863); the "Johnny Ludlow" stories (1874–1880); "Count Netherleigh" (1881); and "About Ourselves" (1883). She died Feb. 8, 1887.

**Wood, Sir Evelyn,** a British military officer; born in Cressing, Braintree, England, Feb. 9, 1838; entered the navy in 1852, serving in the Crimea with distinction in the naval brigade. He then became a cavalry officer, and as brigade-major was present at several engagements in the Indian Mutiny War, receiving the thanks of the Indian government and the Victoria Cross. As lieutenant-colonel of infantry he was with Wolseley during the Ashanti War. He was called to the bar in 1874, but left the Middle Temple to command a column through the Zulu War, leading the advance as Brigadier-General at Ulundi. He served in the Transvaal War (1880–1881), and assisted as commissioner in settling affairs in that region; received the thanks of Parliament for his services in Egypt in 1882, and in the same year became commander-in-chief of the Egyptian army; served in the Nile Expedition in 1894–1895; was quartermaster-general to the forces in 1893–1897; and became Adjutant-General in 1897. He held the Medjidieh order, a knighthood of the Legion of Honor, etc. He wrote: "The Crimea in 1854 and 1894"; "Cavalry at Waterloo" (1896); and "Achievements of Cavalry."

**Wood, Fernando,** an American politician; born in Philadelphia, June 14, 1812. In 1820 he removed to New York city and entered business as a shipping merchant. He became identified with political organizations, being elected to Congress in 1841 on the Democratic ticket, serving one term. In 1850 he retired from business and in 1854 was elected mayor of New York; introduced various reforms and was reëlected almost without opposition. The riot troubles of 1857 prejudiced many citizens against the municipal administration and he was defeated for reëlection, but was again mayor in 1859. In 1861, when secession was under discussion, he recommended that New York should secede and become independent. He was elected to Congress in 1863 and 1867. He died in Washington, D. C., Feb. 14, 1881.

**Wood, George,** an American author; born in Newburyport, Mass., in 1799. He was clerk in the War Department (1819–1822), and later chief of a division in the United States Treasury Department. He published: "Peter Schlemihl in America" (1848); "The Modern Pilgrim" (1855); "Marrying Too Late" (1856); "Future Life" (1858), reissued as "The Gate Wide Open" (1869). He died in Saratoga, N. Y., Aug. 24, 1870.

**Wood, Mrs. Henry.** See WOOD, ELLEN PRICE.

**Wood, James Frederick,** an American clergyman; born in Philadelphia, Pa., April 27, 1813; was educated in England; returned to the United States and entered the banking business. In 1836 he went to Rome to study for the priesthood. After his ordination in 1844 he went to Cincinnati and became an assistant rector of the cathedral and afterward pastor of St. Patrick's church. In 1857 he became Bishop of Philadelphia, where he completed the magnificent cathedral; also laying the foundation at Overbrook of the Seminary of St. Charles, costing $500,000. He was created archbishop in 1875. He was especially hostile to the introduction of political issues from other countries into the United States. He died in Philadelphia, June 20, 1883.

**Wood, John George,** an English clergyman; born in London in 1827. He edited "The Boy's Own Magazine," and "Every Boy's Magazine," and wrote the "Illustrated Natural History" (new ed. 1865–1866), with 1,500 original illustrations; "Homes Without Hands" (1864–1865); "A Popular Natural History" (1866); "Natural History of Man" (2 vols. 1868–1870); "Bible Animals" (1869); "The Modern Playmate" (1878), a book of games; "Man and Beasts, Here and Hereafter" (1874); "Horse and Man" (1886); etc. He died in Coventry, England, March 3, 1889.

**Wood, John Seymour,** an American lawyer; born in Attica, N. Y., Oct. 1, 1853; was graduated at Yale College in 1874 and at Columbia Law School. He was editor of the "Bachelor of Arts," and published: "Gramercy Park: A Story of New York"; "College Days: Yale Yarns"; "A Coign of Vantage"; "A Daughter of Venice"; "An Old Beau, and Other Stories"; etc.

**Wood, Leonard,** an American military officer; born in Winchester, N. H., Oct. 9, 1860; was graduated at the Harvard Medical School in 1884. He was appointed 1st lieutenant and assistant surgeon in the United States army in 1886, and saw active service under General Miles in the Southwestern Territories in the operations against the Apache Indians; was medical and line officer of the expedition, and received a medal of honor for conspicuous gallantry. A short time before the outbreak of the American-Spanish War in 1898, he was detailed as physician at the White House. Having recruited the 1st United States Volunteer Cavalry popularly known as the "Rough Riders," he entered the war as its colonel. He was later promoted Brigadier-General of volunteers, and at the battle of San Juan Hill commanded one of the two brigades of Gen. Joseph Wheeler's cavalry division. After Santiago surrendered he was made military commander of the city, July 20, 1898, and afterward of both city and province. His administration was very efficient and American methods took the place of the Spanish regime. He succeeded General Brooke as military governor of Cuba, Dec. 13, 1899, and held that post till President Palma's inauguration, May, 20, 1902. He then witnessed the German war manœuvres with Generals Corbin and Young; was governor of Moro Province, Philippines, in 1903-1906; commanded the Military Division of the Philippines in 1906-1908, and the Department of the East in 1908-1909. He was appointed a Major-General, U. S. V., in 1899, and a Brigadier-General, U. S. A., in 1901; was promoted Major-General, U. S. A., in 1903; and became chief of staff, U. S. A., Dec. 15, 1909. He was awarded a Congressional Medal of Honor for distinguished conduct as medical and line officer in the Apache campaign (1886) in 1898.

**Wood, Thomas John,** an American military officer; born in Munfordville, Ky., Sept. 25, 1823; was graduated at the United States Military Academy in 1845; served with General Taylor in the Mexican War, taking part in the battles of Palo Alto, Monterey, and Buena Vista; served on the Texan and Kansas frontier for 12 years; and through the Civil War in the Army of the Cumberland, being present at all the battles of that army including Shiloh, Perryville, Chickamauga, Missionary Ridge, the Atlanta campaign, Franklin, Nashville, and at Stone River, where he was severely wounded; and was engaged in operations for the relief of Knoxville and the invasion of Georgia till he was again severely wounded at Lovejoy's Station. He was promoted Major-General of Volunteers in 1865; and retired as a Major-General, U. S. A., in 1868. He died Feb. 25, 1906.

**Wood, Walter Abbot,** an American inventor; born in Mason, N. H., Oct. 23, 1815; early turned his attention to the perfection of farming implements; and in 1850 introduced the Mauny harvesting machine with original improvements, of which in 1851 he made and sold nearly 200. He continued to improve the mowers and reapers and in 1884 disposed of 48,300 machines. His improvements were covered by about 30 patents, and he was awarded the first prizes at the World's Fair in Paris, in 1867, in Vienna in 1873, in Philadelphia, in 1876, and in Paris in 1878. He was a member of Congress in 1879–1883. He died in Hoosick Falls, N. Y., Jan. 15, 1892.

**Wood-Allen, Mary,** an American author; born in Delta, O., Oct. 19, 1841; was graduated at the Ohio Wesleyan University in 1861, and at the Medical Department of the University of Michigan in 1875. She then studied abroad; practised medicine for a time in Newark, N. J., and later removed to Ann Arbor, Mich. Her publications in-

clude "Man Wonderful in House Beautiful" (1883); "Teaching Truth" (1892); "Child Confidence Rewarded" (1893); "Marvels of our Bodily Dwellings" (1896); "Almost a Man" (1896); "Almost a Woman" (1897); "Baby's First" (1898); "What a Young Woman Ought to Know" (1898); "What a Young Girl Ought to Know"; etc. Died in 1908.

**Wood Anemone,** the *Anemone nemorosa;* rootstock horizontal, woody; leaves trifoliate, with the leaflets few, lanceolate, lobed, and cut, remote from the flower; involucre similar to their petiolate, stem with a single flower on a scape, sepals six, rarely five to nine, resembling petals, sometimes tinged on the outside with purple; point of achene not feathery.

**Wood Ant,** the *Formica rufa,* an exceedingly common species. Head and thorax rusty red, with a blackish-brown tinge in parts, legs and abdomen of the latter hue; the largest workers are about a quarter of an inch long. Found in woods, where it heaps up a great mass of vegetable fragments, beneath which the nest is continued in a great extent of subterranean passages and chambers. The wood ant possesses no sting, but has the power of ejecting its acid secretions to keep enemies at a distance.

**Wood Baboon,** the *Cynocephalus leucophæus,* allied to, but smaller than the mandrill. It is a native of the coast of Guinea; fur greenish, whitish beneath; callosities scarlet. Called also cinereous baboon, drill, and yellow baboon.

**Woodberry, George Edward,** an American poet; born in Beverly, Mass., May 12, 1855; was graduated at Harvard College in 1877; was Professor of English Literature in Nebraska State University in 1877–1878 and 1880–1882; in Columbia College in 1892. Besides numerous articles in magazines and reviews, he wrote: a "History of Wood Engraving" (1883); "Life of Edgar Allan Poe" (1885); and "The North Shore Watch, and Other Poems" (1890); "Studies in Letters and Life" (1890); "Heart of Man" (1899); "Wild Eden" (1899); "Makers of Literature" (1900). He published also an edition of Shelley (1894), and one of Poe (1895), with E. C. Stedman.

**Woodburytype** (named from the inventor of the process, Mr. Woodbury, a London photographer), a method of obtaining permanent impressions from a photograph. A film of bichromatized gelatine on a sheet of glass is exposed under a photographic negative, and the portion unacted upon by the light washed away with water, leaving the printed parts in relief. After drying it is laid on a perfectly flat metallic plate, and a sheet of lead pressed down on it by a powerful press, an exact mold being thus obtained. A viscous solution of gelatine mixed with a small proportion of a pigment or dye is next poured over the mold, and a sheet of strongly sized paper placed on top and firmly squeezed. On carefully removing the paper a perfect impression is obtained, and this is fixed by immersing in a strong solution of alum. Any number of copies may be obtained from the same mold.

**Wood Carpet,** in ordinary language, a floor covering made of slats, or more ornamental shapes, glued or cemented on a cloth backing. In entomology, a geometer moth, *Melanippe rivata.* Fore wings gray, with a broad dark gray central band. The caterpillar feeds on *Galïum mollugo.*

**Wood Carving.** an art of great antiquity, now followed largely in France, Italy, and Switzerland, and recently introduced in the public school systems of the United States. The following tools will be found ample for a beginning, and they can be purchased for a comparatively small sum, ground and handled, ready for use, at almost any hardware dealer's: One 9-16 and one 5-16 firmer or flat chisel; one 6-16 corner chisel or skew; a 9-16 and 6-16 flat gouge; a 6-16 hollow gouge and a 3-16 parting tool; a slip of oil-stone, formed to fit the concave tools; a mallet and a pair of coachmaker's iron clamps No. 14; a little oil and a sheet of black transfer paper. The latter can be made by mixing lampblack with castor oil to a thick paste and then applying it to one side of a piece of newspaper, gently wiping off the surplus grease with a piece of rag. As a bench to work on, a good strong kitchen table will be found to answer the purpose very well. Now take a board of common pine or whitewood, about 16 inches long and 10 inches wide and 1 inch thick; fasten this firmly to the table by means of the clamps; then rule a few straight lines from end to end of the board three-eights of an inch apart; take the hollow gouge and hollow this space out, holding the handle of the tool in the right hand, keeping the wrist almost down on the wood, and with the thumb and forefingers of the left hand or the whole of the hand which is sometimes necessary, guide the tool, pressing gently, go slowly along and remove a thin, curled shaving. These shavings should be cut as evenly in thickness as possible, in a uniform, straight groove. Never move the tool from side to side in the wood. When several of these grooves have been cut straight and uniform in width, rule several across the grain; this will be found much harder to cut, the tool meeting with more resistance. Yet a few trials will give satisfactory results. Turn the board over and make a few circles and gouge them out around the outside edge. This will be found more difficult still, yet from this practice the learner will become somewhat familiar with the gouge.

Designs are either drawn on or transferred to the wood. Then with the parting or V tool go along the outline of the design, making a clean cut, uniform in depth and width, following the line as accurately and as closely as possible without destroying it. This kind of carving may be used on woods after they have received their finish. It is much used for the decoration of work boxes, handkerchief boxes, glove boxes, photograph frames, book racks, foot stools, chairs and small table tops. The background, that is the wood between a design in this class of carving, is generally stamped down with a checkered punch, varying the background from that of the design. A large nail will do for this purpose by filing the point crosswise, making several little points or diamond shapes at the end. Incised carving is sunk carving, that is the design is cut below the general surface of the materal. Transfer the design as above; then take the parting tool and go along the outline of the design, making a smooth, clean cut. Carefully study the design that has been selected. If it is a floral one, observe where one leaf folds over another and where a stem disappears under a leaf or ornament; where leaves are partly folded, where depressions and elevations occur. Where one leaf overlaps another the lower leaf is cut down to indicate that the other overlaps or lies on it. Remove very little wood at a time, gently sloping from the highest place to the lowest, making the edges sharp and accurate. This will give much delicacy and beauty of finish. This kind of carving can be used on all articles mentioned above. In relief carving the wood about the design is cut below the general surface, leaving the pattern in relief.

Some work looks well finished in oil, giving it a subdued effect. Black walnut and oak may be successfully treated by applying three or four coats of raw linseed oil at intervals of a few days. It should be applied with a brush, allowing as much oil as the wood will absorb. Should the work become sticky it can be removed by rubbing with a piece of felt, saturated with crude kerosene oil. To polish flat surfaces, such as table tops, the wood must be well sandpapered with No. 0 sandpaper; all knotholes and flaws must be stopped with wax. The wood is then filled with some patent filler; thinned down with turpentine to the consistency of cream. It is then rubbed into the wood with a rag or excelsior shaving, so that the pores are effectually closed. It speedily hardens, and in a few minutes the surface may be cleaned without rubbing any from the pores. The work is then laid aside till the next day. Then it may be given a coat of shellac, putting it aside again for a few hours to harden. When hard it is well rubbed with No. 0 sandpaper till perfectly smooth. A final polish is obtained with a rubber. The rubber consists of a small ball of cotton batting, which is covered with a piece of soft linen rag wrapped so as to leave a handle at the back for the hand. Partly saturate the rubber by placing it on the mouth of the bottle, throwing the solution toward it two or three times. In the middle of the varnish on the rag place a little raw linseed oil. Begin the rubbing in small circular strokes till all pores are filled, charging the rubber with varnish and oil when required till the whole surface has had one coat. When dry repeat the process till the surface appears even and fine. Between each coat use fine sandpaper to smooth down all irregularities. Lastly, use a clean rubber, with a little wood alcohol only, which will remove the oil and the cloudings it causes. Should the work become sticky and rough at any stage of the process it can be removed by touching the surface here and there with a little oil.

Ebony effects are best produced with cherry wood, which should be thoroughly sandpapered, and all holes and knots thoroughly stopped with wax. The wood is then ready to receive four coats of black shellac, made as follows:

Take half a pound of lampblack and one ounce of ultramarine blue, put into a vessel and stir in shellac till the ingredients are as thick as cream; strain through cheese cloth.

Give the wood three or four coats, allow a day or so to thoroughly dry, then polish as above. For oak effects, give the wood one heavy coat of strong ammonia. Let this thoroughly dry. The parts that are to be relieved are to be eaten off with oxalic acid. Great care must be taken when using this acid, for if it gets on the hands or clothes it will burn them. If this is to be a varnish finish, give four coats of rubbing varnish; finish the same as other woods. The following is a list of woods best adapted for the carver's use: Sweet gum is a most beautiful wood to carve, the path of the tool being easy, leaving a cut both smooth and glossy. It is even in grain, light brown in color, and capable of taking a very high polish. White maple is even in grain and almost as white as holly, but very hard, almost as hard as oak. Sycamore is a good wood of a creamy color, flecked with brown. Black walnut is popular because it is dark brown in color. Cedar and mahogany are excellent for the beginner to handle. Other woods are white walnut, lime, apple, pear, ash, and elm. It is in woods of moderate hardness, allowing the tool to fly quickly and smoothly through the material, that the finest effects can be obtained.

**Woodchat,** in ornithology, the *Lanius auriculatus*, an African shrike, ranging from the Mediterranean to the Cape of Good Hope, and visiting Europe in the summer.

The popular name is misleading, as the bird has no affinity with the chats, and to avoid confusion some authors call it the woodchat shrike; length rather more than seven inches; upper parts mostly black, crown of head and nape chestnut red, outer tail feathers, spots on wings, streak above the base of bill on each side, and under surface white.

**Woodchuck,** in zoölogy, the *Arctomys monax,* a small American burrowing rodent, ranging from the Carolinas to Hudson Bay, and W. from the Atlantic coast to Missouri, Iowa, and Minnesota; length from 15 to 18 inches; blackish or grizzled on upper surface, chestnut red below; body stout, head broad and flat, legs short and thick. The woodchuck is a vegetable feeder, and may be easily tamed; called also the ground hog.

**Woodcock,** in ornithology, the *Scolopax rusticula* (the *rusticola* of Linnæus is a misscript); distributed over Europe, the N. of Asia, and as far E. as Japan, visiting Europe in October and departing in March, though some remain to breed, and the number is yearly increasing. The woodcock is about 13 inches long; upper surface varied with ruddy, yellowish, and ash tints, and marked with great black spots; lower parts yellowish-red with brown zigzags; quills striped with red and black on their external barbs, tail feathers terminated above with gray and below with white. The female is rather larger and stouter than the male. One of the most interesting traits about the woodcock is the fact of its occasionally conveying its young through the air; which is done by only one or two other birds. The fact was known in the middle of the 18th century but Gilbert White rightly surmised that Scopoli erred in supposing that the young one was conveyed either by or in the bill. When the parent bird wishes to convey her young one from a place of danger to one of safety, the tiny thing is gently pressed between the feet and against the breast, the aid of the bill only being resorted to when the burden has been hastily taken up. The American woodcock, *Philohela minor,* is a smaller bird, but resembles the European species in plumage and habit, and like it, is esteemed for the table. In zoology, a collector's name for some species of the genus *Murex,* from the resemblance of the spines of the elongated tube to the bill of the woodcock. *M. tenuispina* is the thorny woodcock, and *M. haustellum* the woodcock's (or snipe's) head.

**Wood Engraving,** the art of engraving designs on wood. It differs from copper and steel plate engraving by having the parts to be printed on the paper in "relief." While plates are printed from the engraved lines by a laborious and necessarily slow process wood engravings, having the object to be represented on the surface, in the manner of a type, may be printed along with the matter they are intended to illustrate in the ordinary printing machine. This, of course, is an important point in the illustration of books, on the ground of cheapness and expedition. Another advantage wood engravings possess is that they can be multiplied to any extent by means of the electrotype process.

The invention of wood engraving, like that of gunpowder, has been claimed for the Chinese, whose books have been printed from engraved wood blocks for ages. It has been asserted that the art of cutting figures in relief, and printing impressions of them on paper, was known and practised by that nation as early as the reign of the renowned Emperor Wu-Wang (1120 B. C.). There is no doubt that wood stamps were used by the ancient Egyptians and Romans for stamping bricks and other articles of clay; and that wood and metal stamps of monograms, etc., were used in various European countries, for attesting deeds and other documents, at a very early period, when the ability to write was an extraordinary accomplishment even for princes. It is not, however, till the beginning of the 15th century that we find any evidence of the existence of wood engraving, as we now understand it. It appears to have been used in Germany at that time for printing playing cards and figures of saints. The earliest print of which any certain information can be obtained was discovered in one of the most ancient convents of Germany — the Chartreuse of Buxheim, near Memmingen in Bavaria — pasted within the cover of a Latin MS.; it represents St. Christopher carrying the infant Saviour across the ferry, and is dated 1423. It is a work of some merit, notwithstanding its apparent roughness; the infant Saviour and the drapery of the saint being drawn with considerable skill and vigor. Shortly afterward a series of books, printed entirely from wood engravings, called block books, were issued. They consisted principally of religious subjects, with short descriptions engraved on the same block. The most important of them were "The Apocalypse or the History of St. John"; "The History of the Virgin from the Song of Songs"; and the "Bible of the Poor." The illustrations seem to be drawn with a supreme contempt for perspective and proportion, but bear evidence of the draperies, and hands and faces, having been carefully studied.

Previous to the invention of movable types whole books of text were also engraved in wood, and the impressions had evidently been taken by rubbing on the back of the paper, instead of steady pressure, as in the printing press, the ink used being some kind of distemper color.

The psalter printed by Fust and Schöffer at Mainz in 1457 is illustrated with initial letters engraved on wood, and printed in

two colors, blue and red, which have been called "the most beautiful specimens of this kind of ornament which the united efforts of the wood engraver and the pressman have produced. They have been imitated in modern times, but not excelled." It is worthy of note that, though printed upward of 400 years ago, the freshness and purity of the colors remain unimpaired.

As printing spread, the publication of illustrated books became general in Germany and Italy, and reached England in 1476; in which year Caxton published the second edition of the "Game and Playe of the Chesse," with figures of the different pieces. They are very rude compared with the earlier German works. Several works followed, all, however, executed in the same rude manner. The first attempt at something finer than simple lines appears in the frontispiece to the Latin edition of Breydenbach's "Travels," printed at Mainz by Erhard Reuwich, 1486. It is by an unknown artist, is an elaborate and really very beautiful specimen of the art, and is also remarkable as being the first engraving introducing "cross hatching" to represent dark shadows. A work of Poliphilus, printed at Venice by Aldus in 1499, is worthy of mention for the extreme beauty of the designs, which have been ascribed by some authorities to Raphael, and by others to Mantegna.

About the beginning of the 16th century a complete revolution in the art of wood engraving was accomplished by the genius of Albert Dürer. His productions exhibit not only correct drawing, but a knowledge of composition and light and shade, and attention to the rules of perspective, which, with the judicious introduction of subordinate objects, elevated them to the rank of finished pictures. There has been considerable discussion as to the probability of Dürer having also engraved his drawings. Most of the best authorities on the subject, agree in the negative. The best of Dürer's contemporary artists on wood were the painters HANS BURGKMAIR (*q. v.*), LUCAS CRANACH (*q. v.*), and Hans Schäufflein. A series of works projected by the Emperor Maximilian were illustrated by these artists; but they are not equal to those of Dürer.

During the first half of the 16th century the publication of books illustrated with wood engravings still increased, and prevailed to a greater extent than at any other time, with the exception of the present day. The superiority of talent, both in drawing and engraving, however, still remained with the Germans. In France, although their figure subjects were inferior to those of their German neighbors, their ornamental borders in prayer books, etc., of which a great number were printed at this time, were extremely beautiful. In Italy and England the art was very far behind. The most remarkable work pulished at this time was the "DANCE OF DEATH" (*q. v.*) issued at Lyons in 1538. The original edition of this curious work contained 41 engravings, representing the struggle between Death, generally in the form of a skeleton, and different individuals, such as the Pope, the emperor, a judge, monk, doctor, duchess, old man, etc. The drawings, which are characterized by great vigor and skill, are generally understood to have been executed by Hans Holbein; but whether he also engraved them, as has been alleged, is more than doubtful. Toward the conclusion of the century, however, the art had made considerable progress in Italy, where some of the best productions of Germany were equalled, if not excelled. In England it did not make much progress. John Daye published almost the only illustrated books of the time, notably Queen Elizabeth's prayer book, which contains a tolerably well executed portrait of Her Majesty. There is no certain knowledge about any of the artists or engravers, though John Daye is supposed to have engraved some of his blocks himself. At this time also the practice of printing wood engravings in colors from different blocks became somewhat common, though the attention of artists in that line was mostly confined to ornamental subjects.

From the beginning of the 17th century the decline of wood engraving may be dated, Germany, the cradle of the art, being the first to forsake it; the only works worthy of notice were a series of blocks on various subjects — designed by Rubens, and engraved by Christopher Jegher of Antwerp, one of the best wood engravers of that period — some of which are of great beauty. From this time the art fell into a state of great neglect, not apparently for want of engravers, for woodcuts of a certain kind were always produced, but for want of artists able or willing to make drawings worthy of preservation.

Nothing particularly deserving of notice occurred till 1766, when John Michael Papilon, an enthusiastic professor of the art in France, published an elaborate history of the subject. But it was not till the genius of Thomas Bewick was brought to bear on it that wood engraving received that impetus which has made it one of the most important of the illustrative arts. Bewick's most important works are his "History of British Quadrupeds" (1790) and of "British Birds" (1804); all the quadrupeds and almost all the birds were drawn and engraved by himself. The birds especially are executed with a truthfulness and skill which has rarely if ever been equalled. These works are also famous for their collection of tailpieces, which display an infinite amount of humor and pathos. He entirely abandoned the elaborate system of "cross hatching" which prevailed so much in the works

Wood Engraving

of the older engravers, and produced his light and shade by the simplest possible means.

Since Bewick's time wood engraving has continued to flourish without interruption. He left behind him several pupils, the most successful of whom were Nesbet, Clennell (who engraved some of the tailpieces in the "British Birds"), and William Harvey. Harvey, however, forsook the burin for the pencil; and his drawings illustrating Milton's "Paradise Lost," Thomson's "Seasons," etc., especially such as were engraved by John Thomson, still retain a first-class place as specimens of wood engraving. The establishment of the "Illustrated London News" (1842) tended greatly to familiarize the public with the beauties of wood engraving. In the pages of that periodical appeared the first drawings on wood of (Sir) John Gilbert and Birket Foster. The spirited figure subjects of the former and the exquisite landscapes of the latter did much to raise the art to the very high place it now occupies in England.

The closing quarter of the 19th century was an important period in the history of wood engraving, from the rise of what has been called the American school, which has had a considerable effect and many followers in England. It is typified in many of the finer illustrated magazines published in the United States and England, and much of their work is very beautiful. At first their tendency was to use the burin to imitate something else, such as chalk or pencil drawings, which they did with great fidelity; but this could scarcely be called the proper province of wood engraving. W. J. Linton, the veteran wood engraver, advocated a simpler style of line, such as used by himself with masterly skill. Though his advice was ridiculed, an undoubted change in this direction gradually took place.

*Practice of Wood Engraving.*—The wood used for engraving is boxwood, which has the closest grain of any wood hitherto discovered. It is principally imported from Turkey for the purpose, as the English box is too small to be of much use. It is cut across the grain in slices, which are dressed to the same height as type for convenience in printing. Inferior kinds of wood, such as American rock maple, pear tree, plane tree, etc., are used for coarser purposes; and for very large and coarse subjects, such as posting bills, common deal is used, and cut on the side of the wood with chisels and gouges. When blocks — as the pieces of wood are termed — are required of a larger size than a few inches square it is necessary to join two or more pieces together, as the amount of sound wood to be got out of even a large slice is extremely limited. There is, however, for all practical purposes no limit to the joining process, as blocks have been printed consisting of from 50 to 100 pieces. The wood having been made very smooth on the surface, and squared to the required size, the surface may be prepared with water-color Chinese white, and the subject to be engraved drawn upon it in the usual way with a brush and pencil; or it may be photographed on the wood from a drawing made on paper. The latter method has many advantages, and is almost universally employed. The drawing is not destroyed in the process as if executed on the wood, but can be used to refer to, in touching up the engraving, and it may be sold separately if of value. When the block is prepared with the drawing, or photographed, it is given to the engraver, who, previous to commencing, carefully covers it with paper, fastened round the edges with beeswax; this is necessary, to avoid rubbing the drawing out in the process. As the engraving proceeds he gradually tears the paper off.

The tools or gravers necessary in wood-engraving are of many varieites, from those with fine points to cut fine lines, ranging through all sizes up to small chisels to cut out the wide white pieces. Most engravers use a glass of slight magnifying power, more for the purpose of relieving the eyes from the strain of fixing both eyes closely on a small object than for magnifying the work. When gas or other artificial light is used a glass globe filled with water, slightly tinted with blue (to neutralize the reddish glare of the light), is placed between the flame and the work; this serves the double purpose of concentrating the light on the block and keeping it out of the eyes. When the drawing is in outline, or mostly so, the engraving is very simple; the process consists of engraving a line along each side of the pencil lines, which are, of course, to be left in relief, and afterward cutting out the pieces between. It will thus be understood that every part of a woodcut which prints on the paper is the surface of the wood left untouched, and that every white part is cut or hollowed out. When it is complicated with much shading, trees, etc., it becomes much more difficult, and brings into play the artistic talents of the engraver to preserve the proper shades, or color, as it is technically termed, and texture of the different objects, the most skill being required where the drawing has been executed entirely or mostly by brush work, and the execution is left entirely to the engraver. By a judicious use of his various tools, cutting out or leaving the lines thicker or thinner, marvellous effects may be produced by very simple means. Some of the finer portraits entirely engraved from photographs from life, which may be seen in many of the better class magazines, are wonderful instances of this skill, and are worthy of careful study.

When the drawing is all engraved, a proof is taken by inking the surface gently with

printing-ink on a dabber (a ball of cotton covered with silk or leather), and, a piece of india-rubber being laid on it, by rubbing the paper with an instrument called a burnisher till it is all printed, or, where the block is large, printed in a small press. The engraver then sees what touching up it requires before it is finished and ready for the printer.

When large blocks are to be engraved the pieces of wood are joined with screw bolts, and the drawing prepared in the usual manner; after which the pieces can be taken separate for convenience in engraving, and also for the purpose of getting it quicker finished by having an engraver working at each piece—a matter of some consequence in many cases, as for example, in the large engravings in the illustrated newspapers. See BEWICK, THOMAS: ELECTROTYPE: ENGRAVING: DÜRER, ALBERT: XYLOGRAPHY.

**Wooden Spoon,** a term applied in Cambridge (England) University to the student last on the list of mathematical honors. At Yale College an immense spoon, made of wood, conferred in junior year, as a highly esteemed prize, on the most popular man of his class.

**Wooden Wall,** the side of a ship; hence, a ship itself. When Athens was in imminent danger from the Persians, 483 B. C., during the invasion of Xerxes, the oracle at Delphi was consulted, and intimating that the city and country were doomed to ruin, added that—when all was lost, a wooden wall should still shelter her citizens. The Athenian young men interpreted "a wooden wall" to signify ships; Themistocles, who had probably influenced the oracle to utter the prediction or counsel it had given, was of the same opinion; faith was put in the navy, and the result was the great victory of Salamis. It was from this incident that the expression, "The wooden walls of England," arose.

**Woodford, Stewart Lyndon,** an American lawyer; born in New York City, Sept. 3, 1835; served with gallantry in the Civil War, retiring with the rank of Brigadier-General of volunteers by brevet; on the cessation of hostilities he resumed the practice of law; in 1866 was elected lieutenant-governor of New York on the ticket with Reuben E. Fenton; in 1872 member of Congress; in 1877 appointed United States Attorney for the Southern District of New York; in 1897 was appointed minister to Spain, where he remained till the beginning of the American-Spanish War in 1898; and in 1907-1909 was president of the Hudson-Fulton Commission.

**Wood Hoopoes,** in ornithology, the genus *Irrisor,* sometimes placed with the *Upupidæ,* but by some authorities raised to the rank of a family, *Irrisoridæ.* There are 12 species, strictly confined to Africa, ranging from Abyssinia to the W. coast, and S. to Cape Colony. Bill curved; tail very long and strongly graduated; dark, metallic plumage, inclining more or less to black. They form a connecting link between the true hoopoes and the hornbills.

**Woodhull, John Francis,** an American scientist; born in Westport, N. Y., July 2, 1857; was graduated at Yale University in 1880; became Professor of Physical Science at the Teachers' College, Columbia University, in 1888; and a lecturer on university extension. He was the author of "Simple Experiments for the School Room" (1899); "First course in Science" (1893); "Manual of Home-made Apparatus" (1895); "Chemical Experiments, a Laboratory Manual" (1899, with M. B. Van Arsdale); "Educational Value of Natural Science"; "Academic Syllabus for Physics and Chemistry"; etc.

**Woodlark,** the *Alauda arbores,* differing from the SKYLARK (*q. v.*) in its smaller size, its shorter tail, more distinctly marked breast, and a conspicuous light-colored streak extending over each eye and the ear coverts. Its note has neither the power nor variety of the skylark, but is superior in quality of tone and is longer in duration. The nest is composed of grasses, moss, and hair, placed on the ground; eggs usually four or five, white covered with little red-brown spots.

**Wood-leopard Moth,** a European moth, *Zeuzera æsculi.* Wings white, half-transparent, with bluish-black spots, the fore ones the brighter. Thorax white, with three bluish-black spots on each side; abdomen bluish-black, with white scales. Expansion of wings, in the male two inches, in the female two and a half. Caterpillar yellow, with shining black spots; it feeds on the elm, the horse-chestnut, the pear, the apple, etc.

**Wood Lice,** the *Oniscidæ,* a family of terrestrial Crustaceans included in the order *Isopoda.* The body is more or less oval in outline and flattened; the head bears a long pair of antennæ, another rudimentary pair, a pair of lateral eyes, and jaws; the thorax bears seven pairs of walking legs; the abdomen has six pairs, of which the first five overlap like tiles, and the most anterior are modified to contain air. All live on land, in more or less damp places, hiding during the day, seeking their food in the darkness. The reproductive processes are very complex. When the female is impregnated in spring, she receives the male elements in two sperm-sacs; these burst into the closed oviducts; a moulting takes place, and a genital aperture is formed on the body wall; the fertilized ova burst from the oviducts into the body cavity,

and pass out by the genital slit into brood chambers on the legs; when the hatched young leave the brood chamber another set of ova are squeezed into it; after all is over the female moults again and acquires its original characteristics. About 18 genera and 250 species are known — *e. g.*, *Oniscus murarius* (known in Scotland as *Slater*), common under stones; *Porcellio scaber*, equally common; *Armadillidium vulgare*, able to roll itself up into a ball; *Ligidium personii*, frequent among damp moss and rotten wood; *Ligia oceanica*, on rocky shores. The wood lice are vegetarian animals, eating both fresh and decaying plants, and some do harm in gardens.

**Woodmen of America, Fraternity of Modern,** a fraternal benefit society organized in 1883. In 1909 it reported a membership of 1,952,673, and benefits disbursed since organization $79,741,753.

**Woodmen of the World,** a fraternal benefit society founded in 1891. In 1909 it reported a total membership of 439,285, and benefits disbursed since organization, $30,890,266.

**Wood Naphtha.** See PYROXYLIC SPIRIT.

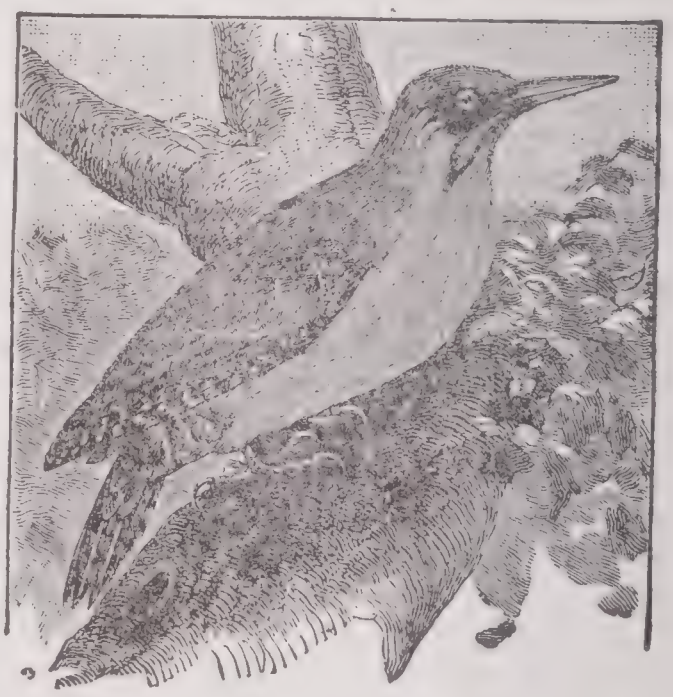
**Wood Mouse,** the *Mus sylvaticus*, the long-tailed field mouse, common over the temperate parts of Europe and Asia. It is a little larger than the common mouse, with a proportionately longer tail; yellowish-brown on upper surface, whitish beneath.

**Wood Nymph,** a fabled goddess of the wood; a dryad. In zoölogy, the common name of the beautiful lepidopterous insects comprising the genus *Eudryas*. The wood nymph (*E. grata*) expands one inch and a half to one inch and three-fourths, the fore wings pure white, with a broad stripe along the front edge for more than half its length, and a broad band around the outer hind margin, of a deep purple brown, the band edged on the inside with olive green, and marked toward the edge with a wavy white line; under side of the fore wings yellow, with a round and kidney-shaped black spot. The hind wings are yellow, with a broad purplish brown hind border above, on which there is a wavy white line; below they have a central black dot. The caterpillar, which infests the grape vine, attains one inch and a quarter in length, is blue transversely, banded with deep orange, the bands dotted with black; the top of the eleventh ring is humped.

**Wood Oil.** See GURJUN BALSAM.

**Wood Opal,** a variety of opal with a peculiar ligneous structure, which is made into snuff-boxes and other ornamental articles at Vienna.

**Woodpecker,** in ornithology, the popular name of the old Linnæan genus *Picus*, now greatly divided. Woodpeckers have a slender body, powerful beak, and protrusile tongue, which is sharp, barbed, and pointed, and covered with a glutinous secretion derived from glands in the throat, this coating being renewed every time the tongue is drawn within the bill. The tail is stiff, and serves as a support when the birds are clinging to the branches or stems of trees. The plumage is generally of strongly contrasted colors, black and white, or green and yellow, with red marks about the head. Woodpeckers are very widely distributed, but abound chiefly in warm climates. They are solitary in habit, and live in the depths of forests. Fruits, seeds, and insects constitute their food, and in pursuit of the latter they exhibit wonderful dexterity, climbing with astonishing quickness on the



GREEN WOODPECKER.

trunks and branches of trees, and when, by tapping with their bills, a rotten place has been discovered, they dig vigorously in search of the grubs or larvæ beneath the bark. The common notion that they are injurious to trees is erroneous, as they do more good by preventing the ravages of insects than harm by their pecking. They roost and breed in hollow trunks, or holes in trees, enlarged by their strong, sharp bills; the eggs, which are white, smooth, and glossy, vary considerably in number, and are desposited on a bed of chips at the bottom of the hole.

**Wood Pigeon,** a well-known bird distributed generally over Europe. Length about 17 or 18 inches, head, chin, and part of neck blue-gray, rest of neck and breast purple-red; bare skin at base of bill nearly white; feathers on sides of neck tipped with white so as to form portions of oblique rings; upper parts and wings slaty bluish-gray; plumage of hen less brilliant. Varieties more or less spotted with white

often occur, and perfect albinos are sometimes met with. The food of the wood pigeon consists of corn and grain, beechmast, peas, tares, acorns, the young shoots of turnip tops, and spring-sown corn; and, as these birds make no return to the farmer by destroying his insect foes, their rapid increase is a source of grave anxiety to agriculturists. The nest of the wood pigeon is a mere platform of loose sticks, so carelessly constructed that eggs and young birds are often blown therefrom and destroyed. The eggs are always two in number, white and oval; two and sometimes three broods are produced in the year. The ordinary flight is very strong and rapid, and, if disturbed, the bird springs into the air with a peculiar flapping of the wings, which may be heard at a considerable distance.

**Wood Pulp,** a preparation of wood used in the manufacture of paper and in other industries. There are two kinds of wood pulp, one known as ground or mechanical, and the other as chemical. The first is the cheapest and is used chiefly for making newspaper and common wrapping paper stock. In this kind spruce wood is most commonly employed, because it is cheap and gummy, the latter quality being valuable in that it adds much to the tenacity of the material made from the pulp. In the manufacture of ground pulp swiftly revolving emory wheels are worked under water. The spruce logs are pressed against these till reduced to a fine wet sawdust. It has, however, now lost its fiber, and must be mixed with one-fifth chemical wood pulp, so that it will hold together in the form of paper.

Chemical wood pulp is made by cutting up spruce and poplar logs into small chips, which are then placed, with a liquor, in enormous tanks to be digested. If poplar chips are used, the liquor is made of caustic soda ash and water; but if spruce chips, they are treated by what is known as the acid process. In the latter case the liquor is made by a mechanical combination of sulphurous acid gas with milk of lime, which forms a bisulphite of lime. The walls of the digestor are lined with acid-proof bricks. When the chips and the liquor are placed in the digestor it is hermetrically sealed and live steam introduced, till the pressure reaches about 110 pounds. The whole mass is then kept boiling for 8 or 10 hours, at the end of which time the digestors are opened, the pulp removed and the liquor washed out of it. It is then bleached and subjected to a process of beating and macerating, after which it is ready to mold or to manufacture into paper. Book and magazine papers are now made from chemical wood pulp. The pulp is also put to many other uses. Basins, buckets, cups, and many small articles are made from it and it is employed in the so-called "paper car wheels." In Prussia bricks of this material are found excellent for building underground conduits, because of their insulating properties. Pipes and drain tiles, as well as telegraph poles, are made of wood pulp, and in Europe a manufacturer has put on the market wood pulp coffins, highly polished and artistic in appearance. In 1894 imitation silk thread was made from it in England and France and found to be smooth and durable.

**Woodrow, James,** an American educator; born in Carlisle, England, May 30, 1828. He edited the "Southern Presbyterian Review" in 1861–1865, and after 1865 was editor of the "Southern Presbyterian." After filling several professorships in various Southern colleges, he became president of South Carolina College in 1891. He published many review articles, including: "Geology and its Assailants" (1862); "An Examination of Certain Recent Assaults on Physical Science" (1873); "A Further Examination" (1874); etc. He died Jan. 17, 1907.

**Woodruff,** the *Asperula odorata,* a perennial herb, allied to the bedstraw, of wide distribution, entering into the flora of most countries of Europe, the Mediterranean region and Western Asia, and is a common plant of shaded hedge banks, copses, etc., in the British Isles. It does not possess any economic value, but is notable for possessing the agreeable fragrance of cumarin during and after drying. The genus *Asperula* numbers about 50 species, natives of the temperate regions throughout the world. The root of *A. tinctoria* has been used as a substitute for madder, and *A. cynanchica* bears the name of squinancy wort from its efficacy in curing quinsy. Woodruff is sometimes used to flavor wine.

SWEET WOODRUFF.

**Woodruff, Edwin Hamlin,** an American lawyer; born in Ithaca, N. Y., Sept. 2, 1862; was graduated at Cornell University School of Law in 1888, and admitted to the bar in the same year; was instructor of En-

glish at Cornell in 1888–1890; acting Professor of Law at Leland Stanford University in 1893–1896; then became Professor of Law at Cornell. His publications include: "Cases on Domestic Relations" (1897); "Introduction to the Study of Law" (1898); "Cases on Insurance" (1900); "Digest of the Law of Tort" (1900); "Chancery in Massachusetts"; etc.

**Woodruff, Wilford,** an American Mormon; born in Northington (now Avon), Conn., March 1, 1807; was ordained a Mormon priest in 1833; was one of the Mormon emigrants to Salt Lake City; became one of the 12 apostles in 1839; and later made missionary tours covering over 150,000 miles. In 1887 he was elected president of the Mormon Church. For 22 years he held a seat in the Utah Legislature. He died in Salt Lake City, Utah, Sept. 3, 1898.

**Woods, Mrs. Kate (Tannatt),** an American writer; born in Peekskill, N. Y., in 1838. She lectured. Among her books are: "Six Little Rebels"; "Out and About"; "Dr. Dick"; "The Wooing of Grandmother Grey"; "Grandfather Grey"; "Children's Stories"; "Toots and his Friends"; "The Duncans on Land and Sea"; "Mopsy" (1898); "Española" (1901); etc.

**Woods, Katharine Pearson.** an American writer of fiction; born in Wheeling, W. Va., Jan. 28, 1853. Her published works include: "The Crowning of Candace"; "A Tale of King Messiah"; "From Dusk to Dawn"; "A Web of Gold"; "Metzerott, Shoemaker: A Protest against Social Injustice"; "The True Story of Captain John Smith" (1901); etc.

**Woods, Margaret L.,** an English novelist; born in London, in 1859. She was a daughter of Dean Bradley of Westminster, and wife of President Woods of Trinity College, Oxford. She wrote: "A Village Tragedy "(1888); "Esther Vanhomrigh" (1891); "Vagabonds" (1894); also "Lyrics and Ballads" (1888); etc.

**Woods, William Burnham,** an American jurist; born in Newark, O., Aug. 3, 1824; was graduated at Yale in 1845, and admitted to the bar in 1847. In 1857 he was elected to the Ohio Legislature and chosen Speaker of the House. At the outbreak of the Civil War, he entered the Union army as lieutenant-colonel of an Ohio regiment; and was promoted brevet Major-General. At the close of the war he took up his residence in Alabama, and was chosen chancellor of that State in 1868. After serving for two years in this capacity, was appointed circuit judge of the 5th District. In 1880 he was appointed an associate justice of the United States Supreme Court. He died in Washington, D. C., May 14, 1887.

**Wood Sage,** the *Teucrium scorodonia;* one to two feet high, with oblong ovate, very much wrinkled leaves, green on both sides, and downy; inflorescence in one-sided lateral or terminal racemes of yellowish-white flowers. It is extremely bitter, and has been used as a substitute for hops. It is common in Great Britain in woods and dry stony places, and is found also on the European continent and in North Africa.

**Wood's Halfpence,** a copper coinage for Ireland granted by the English ministry in 1722 to William Wood. He was to share the profit from the difference between the nominal and the intrinsic or bullion value of the coins with the king's mistress, the Duchess of Kendal, who had secured the patent for Wood. Against the whole transaction the "Drapier's Letters" of Swift raised such public indignation that the patent was cancelled, and Wood compensated by a pension.

**Woods Hole,** a village in Barnstable co., Mass.; on Buzzards Bay; and on the New York, New Haven, and Hartford railroad; 72 miles S. E. of Boston. It is the seat of one of the most important stations of the United States Fish Commission, where lobsters, sea bass, cod, and other food fishes are propagated. Besides an extensive fish hatchery, the station is equipped with an excellent marine biological laboratory, in which a corps of efficient teachers annually give instruction to a large number of students. Woods Hole has also long been celebrated as a harbor of refuge for shipping.

**Woodsia** (named after Joseph Woods, 1776–1864, author of "The Tourist's Flora"), a genus of *Polypodeæ;* ferns with pinnate fronds, scattered, roundish sori, having beneath them a cup-shaped involucre, ultimately cut at the edge into many often capillary segments. Known species 14; from the Eastern Hemisphere and North America.

**Woodskin,** a large canoe used by the Indians of Guiana, made from the bark of the purple-heart tree and the simari or locust tree. Some of these canoes are so large as to carry 20 to 25 persons.

**Woodstock,** a market town of Oxfordshire, England, on the Glyme, 7 miles N. N. W. of Oxford; has a chapel mostly rebuilt in 1785, but retaining fragments of 12th century work. The glory of the place is Blenheim Palace, in whose park, laid out by Capability Brown, the tiny Glyme is spanned by a mighty bridge, then widens into an artificial lake, while the trees are ranged as were the troops at Marlborough's victory. The palace itself, designed by Vanbrugh, covers seven acres, and is a heavy, imposing pile, with rich art collections, though its "Titian Gallery" was destroyed by fire in 1861. Glove sewing is the lead-

ing industry of Woodstock. The legends of Fair Rosamond's labyrinth and murder by Queen Eleanor, of Ælfred's and Chaucer's residence at Woodstock, must be abandoned; but as a royal manor from immemorial times Woodstock has played its part in history. Here Æthelred held a gemôt, Malcolm and Rhys paid homage, Edward the Black Prince was born, and Elizabeth was kept in ward by Mary. Here, too, the "just Devil" disturbed the Parliamentary commissioners, as told in Scott's romance, and Rochester made an edifying end. Lastly, in 1704 came the grant to the victor of Blenheim, and the ruthless demolition of the ancient manor house.

**Wood Sorrel.** See OXALIS.

**Wood Spirit.** See PYROXYLIC SPIRIT.

**Wood Swallow,** a name given in Australia to a genus of birds (*Artamus*), family *Ampelidæ* or chatterers. One species (*A. sordidus*) is remarkable for its habit of hanging suspended from dead branches in clusters resembling swarms of bees.

**Woodwardite** (after Dr. S. P. Woodward, of the British Museum), a mineral occurring in botryoidal groups on the walls of a level of an abandoned mine in Cornwall, England. Color, rich turquoise to greenish-blue. Described by Church. Composition: A hydrated sulphate of alumina and protoxide of copper. Subsequent analyses appear to indicate that it is a mixture. Dana puts it as a sub-species of Cyanotrichite.

**Woodworth, Samuel,** an American journalist; born in Scituate, Mass., Jan. 13, 1785. During the War of 1812–1815 he edited, in New York city, "The War," a weekly journal, and "The Halycon Luminary," a Swedenborgian monthly. He was one of the founders of the New York "Mirror" (1823–1824); edited the "Parthenon" (1827); wrote a romantic history of the war, called "The Champions of Freedom" (2 vols. 1816), and several dramatic pieces. His poetical works were published in two volumes in 1861. His famous poem is "The Old Oaken Bucket." He died in New York city, Dec. 9, 1842.

**Wood Wren,** the *Phylloscopus sibilatrix*, a species often confounded with the willow wren, from which, however, it may be distinguished by its larger wings, a broad streak of sulphur-yellow over the eye and ear coverts, and its plumage, which is green above and white below. It differs, also, from most of the warblers in eating neither fruit nor berries, but subsisting on insects or their larvæ. The nest is oval, domed, and placed on the ground; eggs six, transparent, white, thickly spotted with dark purplish-brown.

**Wookey Hole,** a cave near Wells, Somerset, England, situated in dolomitic conglomerate. When discovered it was filled to the roof with debris, in which were found bones smashed and splintered and scored with tooth marks of the hyena; whose remains largely preponderated. The cave appears to have been a hyena's den. Among other species represented were horse, rhinoceros, deer, bear, ox, mammoth, lion, fox, wolf, and lemming. Man's presence was shown by the occurrence of Palæolithic flint implements.

**Wool,** the fleecy covering or pile of the sheep, and some other animals, as the alpaca, the vicugna, and some species of goats. Wool is generally divided into three classes, long, short, and coarse or carpet wool; and these are divided into subordinate classes according to fineness. It differs from all other varieties of hair by the corrugated nature of its fibers, due to the epithelial scales which overlap the course of its fibers, under certain conditions, from their corrugation, interlock with each other and form a felted fabric. Wool is divided into pulled or clipped fleece wool. Pulled wool is pulled by the roots from the skin of the dead animal, the clipped is shorn from the living one. Short-staple wool is used in cloth manufacture, and is frequently called clothing wool. To this class belong the Saxon and Silesian wool of Germany, a portion of the wool of Australia, of the Cape of Good Hope, Buenos Ayres, Russia, Canada, and the bulk of the wool produced in the United States, all being of immediate or remote Merino blood. The qualities and values of these are about in the order in which they are inserted above, the Saxony wool being best adapted to the very finest qualities of broadcloths. Short-staple wool may vary in length from 1 to 3 or 4 inches; if it be longer it requires to be cut or broken to prepare it for manufacture. The felting property of wool is well known. The process for hat making, for example, depends entirely on it. The wool of which hats are made is neither spun nor woven, but locks of it being thoroughly intermixed and compressed in warm water cohere and form a solid tenacious substance. Cloth and woolen goods are made from wool possessing this property; the wool is carded, spun, woven, and then, being put in the fulling mill, the process of felting takes place. The strokes of the mill make the fibers cohere; the piece subjected to the operation contracts in length and breadth. and its texture becomes more compact and uniform. This process is essential to the beauty and strength of woolen cloth. But the long wool of which stuffs and worsted are made is deprived of this felting process. This is done by passing the wool through heated iron combs, which takes away the laminæ or feathery part of the wool, and approximates it to the nature of silk or cotton. Long-staple wool is also called comb-

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ing wool, and delaine wool. To this class belong the long lustrous, down-combing English wool of Leicester, Lincolnshire, and Cotswold; the soft-combing wool of Rambouillet of France; the soft long-staple wool of Australia; the cheviot of Scotland, and the combing wool of Canada, Ohio, Kentucky, Pennsylvania, New York, Maine, and other parts of the United States, all derived from the Leicester or other English blood. The French and Australian are most esteemed for women's dress goods, such as merinos, cashmeres, thibets, and the like; the cheviot for Scotch tweeds, and the English usually for worsted goods. The American wools of this class are of medium quality. Long wool may vary in length from 3 to 8 inches. The shorter combing wools are principally used for hose, and are spun softer than long-combing wools; the former being made into what is called hard and the latter into soft worsted yarn. To the third class, the coarse-staple wools which are adapted for carpets, belong the Donski, and other coarse Russian wool, the native South American, Cordova, Valparaiso, native Smyrna, and other wool.

In sorting wools there are frequently found 8 to 10 different species in a single fleece; and if the best wool of one fleece be not equal to the finest sort it is thrown to a second, or third or fourth, or still lower sort, of an equal degree of fineness with it. The relative value of each varies according to the greater demand for coarse, fine, or middle cloths. The softness of the fiber is a quality of great importance. It is not dependent on the fineness of the fiber, and consists of a peculiar feel, approaching to that silk or down. The difference in the value of two pieces of cloth made of two kinds of wool equally fine, but one distinguished for its softness and the other for the opposite quality is such that with the same process and expense of manufacture, the one will be worth from 20 to 25 per cent. more than the other. Hard wools are all defective in their felting properties. In clothing wool the color of the fleece should always approach as much as possible to the purest white, because such wool is not only necessary for cloths dressed white, but for all cloths that are to be dyed bright colors, for which a clear white ground is required to give a due degree of richness and luster and evenness of shade. Whiteness of fleece is of less importance in the long-combing than in clothing wool, provided it be free from gray hairs. Sometimes the fleece has a dingy brown color, called a "winter stain" which is a sure indication that the wool is not in a thoroughly sound state Such fleeces are carefully thrown out by the wool sorter, being suitable only for goods that are to be dyed black. The fineness of heavy-combing wool is not of so much consequence as its other qualities.

*Manufacture of Wool.*— The art of forming wool into cloth and stuffs was known in all civilized countries, and in very remote ages. Woolen cloths were made an article of commerce in the time of Julius Cæsar and are familiarly alluded to by him. They were made in England before A. D. 1200, and the manufacture became extensive in the reign of Edward III. (1331). The policy of England toward the American colonies was directly intended to discourage and repress manufactures of all kinds, those of woolen goods included. The actual result was that the domestic manufactures of coarser or "home-made" cloths became very widely spread and considerable, and the importations of foreign cloths were proportionally small. A society organized in the limits of the present State of New York, in 1765, deprecated the use of foreign cloths and adopted various measures for increasing the home manufacture, even to rules requiring that the flesh of sheep and lambs should not be eaten nor the animals slaughtered. The supply of wool appears to have been large, and it was mostly worked up and disposed of within the colonies. Many thousands of weavers and cloth workers are said to have come over about the year 1774. The report of Alexander Hamilton on manufactures, in 1791, speaks of a mill for cloths and cassimeres in operation at Hartford, Connecticut, but conveys a doubt whether American wool was suitable for fine cloths. In 1794 there was a woolen factory in Newbury, Mass., and in the same year a carding machine for wool was put in operation in Pittsfield, Mass. President Madison's inaugural suit of black broadcloth was made at Pittsfield in 1804. The United States has produced the best inventions for making felted goods, carpetings, and the like of any other country. The census of 1810 gives for New York the number of looms (largely in private hands) as 33,068 with 413 carding machines, 427 fulling mills, and 26 cotton factories. The total value of woolen manufactures for the United States in the same year was estimated at $25,608,788. From this time the domestic manufacture seems to have fallen off rapidly, and the succeeding census returns must be taken as indicating mainly the reproduction of factories. The total value of woolen goods, which was only $4,413,068, in 1820, was returned by the 1905 census at $319,347,570, besides $61,586,433 for carpets. The principal centers of the woolen industry in the United States are in New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, and Pennsylvania. Till the year 1840, a very great proportion of the cloths imported were of English make; since that time the superior

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dye and finish of French and German cloths have let to their importation to an extent relatively much greater than before. The National Association of Wool Manufacturers of Boston, Mass., estimated the average weight of the fleece produced in 1901 to be 302,502,328 pounds and the imports 103,583,505 pounds.

*Woolen Cloth Manufacture.*— The best woolen cloth is made wholly of new wool. The processes are more numerous than in cotton manufacture, owing to the peculiarities connected with the nap of the cloth. Every bag or bale of wool weighing from 100 to 150 pounds contains various qualities of fiber, which require to be separated for different kinds of cloth. A sorter, with the wool open and spread out before him on a table, separates it into kinds. The names given to these kinds are curiously technical: Picklocks, prince, choice, super-head, downright, seconds, fine abb, coarse abb, livery, short-coarse, breech, etc. The sorter makes as many subdivisions as the kind of wool suggests and the sorted wool is scoured or washed in alkaline liquor, heated to a temperature of 120° F., to drive out as much of the grease and dirt as possible, after which it is washed in clean water. If the cloth is to be dyed after weaving it is called piece dyed; if before, wool dyed, and is used in the production of multicolored fabrics. The "willy" or "devil" is a woolen cylinder studded with iron spikes, and inclosed in an outer case. The wool, fed into the machine along an endless web, is pulled asunder by the revolving spikes. This renders the fibers easy to work, and at the same time shakes out dust and dirt from between them. The opened wool, spread out on a table, is examined by women who pick out and separate all slight impurities which would otherwise deteriorate the cloth. In some factories, a "burring machine" is used for this purpose, comprising a number of fluted rollers, iron beaters, and comb cylinders, which cleanse the fibers in various ways. The wool, by this time nearly free from impurities, is spread out in a thick layer on a stone floor and sprinkled with Gallipoli, or some other oil, one pound of oil to about six pounds of wool. It is passed a second time through the "willy" to mix the oil with the fibers. The scribbling machine converts the mass of oil-wool into a broad, thin, flat fleece, or lap with the fibers open and separated. It is used two or three times over to effect this separation more completely. The carding engine like the scribbling machine, has an action depending chiefly on comb teeth fixed to revolving cylinders. The engine after combing the wool, brings it to the form of separate flat slivers a few feet long, and then into round rovings or rolls from ¼ to ½ inches in diameter, like short pieces of cord. The slubbing billy is a machine comprising a movable frame, spindles, rollers, and wheels so adjusted that when the rovings are placed on a kind of endless apron they are drawn into the machine, joined end to end stretched, and slightly twisted. An improvement on the slubbing machine, a more recent invention called the condenser, combines slubbing with the carding processes. Wool is spun by the mule process, using about 200 spindles on each machine, drawn and wound together. Matters are by this time advancing toward the weaving of the wool into cloth. The yarns are wound on bobbins, transformed into skeins by a kind of reel, and then spooled or wound on another set of bobbins called spools. After sizing, beaming, and one or two subsidiary processes the yarns are woven on looms into cloth. In the technical language of the woolen mills, a bier is 40 warped threads; five biers make a hundred. In ordinary broadcloth of 1¾ wide there are 18 of these double hundreds or 3,600 separate warped threads; finer cloths will go up to 6,000 threads or more. The processes of weaving are very much varied, according as the cloth is to be single, double, twilled, napped, ribbed, and the like. Then comes the operation by which the cloth is thickened, narrowed, and shortened, and the fibers matted or felted together, denominated "fulling." Next comes the remarkable mode of working up the surface into a pile or shag which is called "teasling;" and after that the delicate operation of cutting the pile into a smooth nap, which is called "shearing." The cloth is now piled up into folds with smooth metal plates between them; heavy pressure gives a smoothness and glossiness which are increased if the plates are first heated.

*Worsted Manufactures.*— As long wool possesses the fulling property much less fully than short, the two kinds are adapted for different kinds of goods. Worsted stuffs is the generic name for the long wool goods, but there are many other designations. The processes of manufacture are less numerous than for woolen cloth. When the bags of long wool are open the wool is washed in soap and water to drive out as much of the grease and dirt as may be practicable. It is removed to drying rooms where, spread over the floor, it is dried at a moderate heat. The dried wool is conveyed to a machine, where, instead of being torn asunder by spikes on a revolving cylinder, the locks or tufts are opened by the action of fluted rollers. Long wool must be combed more thoroughly than short, as its excellence depends on other qualities than those of felting. In hand combing the workman employs two combs and a post; the comb consists of long steel spikes fixed into a back, which is held by a handle. One of the

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combs, heated over a peculiar kind of stove called a comb pot, is fixed temporarily in the post with the spikes uppermost, and then the comber, taking a handful of wool sprinkles the fibers with oil, and draws them repeatedly over and between the spikes which comb them out. He places the comb and wool over the stove to renew the heat, and meanwhile operates, in a similar way with the other comb; then the two combs with their two charges of wool are drawn over each other, the spikes of one uppermost and those of the other downward, whereby the combing is carried still further. Another combing follows at a lower heat. The short fibers combed out by this process called "noyls" are reserved for spinning into inferior goods. In machine combing as an improvement on a laborious and unhealthy employment, the wool is temporarily fixed to the surfaces of two cylinders studded with teeth; the cylinders revolve near each other, and the teeth on one comb, comb the fibers attached to the other, the cylinders being heated to the proper temperature by steam power within. The wool, separated into slivers by combing is laid on a feeding apron; as this apron travels forward other slivers are laid on, so overlapping as to get entangled with the ends first applied; this is continued till many slivers become united into one continuous length, the breaking frame being so constructed as to facilitate this operation. The long slivers, received into cases are transferred to the drawing frame, which acts very much in the same way as the breaking frame, uniting into greater lengths the pieces which have been in shorter lengths, but at the same time twisting them slightly and winding them on bobbins. The accompanying table shows the production and consumption of wool in the United States in recent years.

**Wool, By-Products of.** The woolen industry furnishes a number of materials formerly regarded as waste, that are now utilized in the industry itself and for pharmaceutical and other purposes. The principal articles of waste are rags and wool grease. The former is reconverted into wool and used the same as the original raw material, while the latter is employed in other industries. The sheep obtains from the soil of the pastures on which it feeds a considerable portion of potash, which, after circulating through the system of the animal, is excreted with other matter from the skin and becomes attached to the wool. This excretion is known by the French as "suint," and oftentimes constitutes two-thirds of the weight of the fleece. Formerly the suint was allowed to go to waste when the wool was cleaned, and even now a large portion of it that is taken from the fleece is wasted with the wash waters. There is a disposition at present, however, to recover the grease from the wash waters and use it for industrial purposes. At first, attention was directed to the saving of suint for the purpose of obtaining the potash and potash salts contained in it, and with this object a special industry was established in the wool districts of France and Belgium for converting it into commercial products, which were exhibited at the several industrial expositions in Europe, and especial mention was made of them at the Paris Exposition of 1867, many of them receiving silver medals.

The encrusting matters attached to wool, besides the dirt, consist of wool fat, which

| Year Ending June 30. | Production.* | Imports. | Total Production and Imports. | Domestic Wool Exported. | Foreign Wool Exported. | Total Wool Exported. | Retained for Home Consumption. | Per Ct. Imported. |
|---|---|---|---|---|---|---|---|---|
| | Pounds. | Pounds. | Pounds. | Pounds. | Pounds. | Pounds. | Pounds. | |
| 1870... | 162,000,000 | 49,230,199 | 211,230,199 | 152,892 | 1,710,053 | 1,862,945 | 209,367,254 | 23.3 |
| 1880... | 232,500,000 | 128,131,747 | 360,631,747 | 191,551 | 3,648,520 | 3,840,071 | 356,791,676 | 35.5 |
| 1883... | 290,000,000 | 70,575,478 | 360,575,478 | 64,474 | 4,010,043 | 4,074,517 | 356,500,961 | 19.7 |
| 1884... | 300,000,000 | 78,350,651 | 378,350,651 | 10,393 | 2,304,701 | 2,315,093 | 396,035,558 | 20.8 |
| 1885... | 308,000,000 | 70,596,170 | 378,596,170 | 88,000 | 3,115,339 | 3,203,345 | 375,392,825 | 18.8 |
| 1886... | 302,000,000 | 129,084,958 | 431,084,958 | 2,138,080 | 6,534,426 | 8,672,506 | 422,412,452 | 30.6 |
| 1887... | 285,000,000 | 114,038,030 | 399,038,030 | 257,940 | 6,728,292 | 6,986,232 | 392,051,998 | 29.1 |
| 1888... | 269,000,000 | 113,558,753 | 382,558,753 | 22,164 | 4,359,731 | 4,381,895 | 378,176,858 | 30.0 |
| 1889... | 265,000,000 | 126,487,929 | 391,487,729 | 141,576 | 3,263,094 | 3,404,670 | 388,083,059 | 31.7 |
| 1890... | 276,000,000 | 105,431,285 | 381,431,285 | 231,042 | 3,288,467 | 3,519,509 | 377,911,776 | 28.4 |
| 1891... | 285,000,000 | 129,303,648 | 405,303,648 | 292,922 | 2,638,123 | 2,931,045 | 402,372,603 | 31.8 |
| 1892... | 294,000,000 | 148,760,652 | 442,670,652 | 202,456 | 3,007,563 | 3,210,019 | 439,460,633 | 33.6 |
| 1893... | 303,000,000 | 172,435,838 | 475,433,838 | 91,858 | 4,218,637 | 4,310,495 | 471,123,343 | 36.2 |
| 1894... | 298,000,000 | 55,152,558 | 353,152,558 | 520,217 | 5,977,407 | 6,494,654 | 346,654,904 | 15.6 |
| 1895... | 310,000,000 | 206,033,906 | 516,633,906 | 4,279,109 | 2,343,081 | 6,622,190 | 509,411,716 | 39.8 |
| 1896... | 273,000,000 | 230,911,473 | 503,911,473 | 6,945,981 | 6,028,236 | 12,972,217 | 490,939,256 | 46.0 |
| 1897†.. | 259,153,251 | 350,852,026 | 610,005,277 | 5,271,535 | 3,429,063 | 8,700,598 | 601,304,679 | 57.8 |
| 1898†.. | 266,720,684 | 132,795,302 | 399,515,986 | 121,139 | 2,504,832 | 2,625,971 | 396,890,015 | 32.8 |
| 1899†.. | 272,191,330 | 76,736,209 | 348,927,539 | 1,683,419 | 12,411,916 | 14,095,335 | 334,832,204 | 19.2 |
| 1900†.. | 288,636,621 | 155,918,455 | 444,555,076 | 2,200,309 | 5,712,248 | 7,912,557 | 436,642,519 | 34.4 |
| 1901†.. | 302,502,328 | 103,583,505 | 406,085,833 | 199,565 | 3,590,502 | 3,790,067 | 402,295,766 | 22.6 |
| 1909†.. | 311,138,321 | 266,409,304 | 577,547,625 | 28,376 | 3,495,599 | 3,523,975 | 574,023,650 | ..... |

* Calendar year, estimates of Department of Agriculture.
†Estimates of National Association of Wool Manufacturers, Boston, Mass.

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is soluble in ether, and wool perspiration, which is soluble in water. The wool fat and the wool perspiration are together embraced under the name of the "yolk" of the wool. The wool fat is a mixture of a solid alcoholic body, cholesterine, together with isocholesterine, and the compounds of these bodies with several of the fatty acids. These free higher alcohols are soluble in boiling ethyl-alcohol, while the compounds they form with the fatty acids are insoluble in alcohol but soluble in ether. Wool perspiration consists essentially of the potassium salts of oleic and stearic acids, and possibly other fixed fatty acids, also potassium salts of volatile acids, like acetic and valerianic, and small quantities of chlorides, phosphates and sulphates. Thus it will be seen that the yolk of wool contains many elements of recognized value in arts and manufacturing.

When the potash salts are evaporated and ignited, they yield a product of potassium carbonate, and it is estimated that 2,200,000 pounds of this product are saved from the wool wash waters of the mills and scouring establishments of France and Belgium. When the yolk is submitted to dry distillation it yields a residue containing carbonate of potash, nitrogenous carbon of great value for the manufacture of yellow prussiate of potash. According to M. Chandelon, 2,200 pounds of raw wool may furnish 300 quarts of yolk solution of 1.25 specific gravity, having a value of $3.75, while the cost of extraction does not exceed 60 cents.

It is only within comparatively recent years that volatile solvents have been used for extracting the yolk from wool. By far the greater quantity of wool is still cleansed by the old process of scouring with alkalis and washing in a rapid current of water. The volatile-solvent process, however, is coming into use, though now confined chiefly to establishments where large quantities of wool are cleansed. The great cost of the plant for cleansing wool by this method confines it to large establishments.

Within the past five or six years, several methods for cleansing wool and for the recovery of the grease, etc., from the wash liquors, have been introduced into England and on the Continent, that have attracted considerable attention and comment from scientific journals. At the works of Thomas Biggart of Dalry, Ayrshire, the recovery of grease and potash from the wash liquor is effected in the following manner: The suds from the first scouring bowl, containing about nine-tenths of the grease and potash, after standing about 12 hours to insure deposition of the sand, are evaporated in a pan till the liquid attains a syrupy consistency. The resultant liquid is then cooled in shallow iron trays, and the grease which collects on top is removed at intervals. The semiliquid residue is then calcined in a brick oven and the heat produced from it is used to assist in the evaporation. A crude carbonate of potash is thus produced, which, after being completely carbonated, is boiled to dissolve out the potash salts.

Among the most valuable improvements in treating wool fat and producing products therefrom are those covered by a United States patent recently granted to William D. Hartshorne of Methuen, Mass., and Emile Maertens of Providence, R. I. By the methods employed by these inventors five resultant products are obtained from wool fat. The object of the invention is to more thoroughly separate or divide wool fat into products possessing different properties and characteristics, so that the constituent parts of the wool fat, when obtained in a comparatively pure isolated state, are in the best form to be put to the various uses to which each is best adapted. The fat products obtained are applicable to the following uses: As a base for ointments and other pharmaceutical and toilet preparations on account of its penetrating, lubricating, and softening qualities; as a leather and belt dressing, and, when freed from resinous matter, as a lubricant in conjunction with certain lubricating oils; as a lubricant for wool and other animal fibers. This can be used to advantage to increase the specific gravity and viscosity of certain lubricating oils.

The average amount of fat taken out of such wools as are worked in the United States is 15 per cent., which at the minimum price of 3 cents per pound represents 45 cents on every 100 pounds of wool degreased, and if to this is added also the value of the carbonate of potash recovered from the rinsing waters, which on an average amounts to 25 cents net per 100 pounds of greasy wool treated, we have 70 cents as the average minimum value of the by-products recovered from every 100 pounds of raw wool, or seven-tenths of a cent per pound of wool treated.

It is safe to say that from $2,000,000 to $3,000,000 worth of wool fat and potash are run down the streams and wasted annually in the United States. If this wool fat instead of being wasted were recovered, refined or separated into its constituent parts its value would increase at least fivefold, and its uses would multiply. As the freighting expenses from some wool-producing districts to the mills or wool stores are often as high as two cents per pound, and average more than one cent per pound for that part of the wool clip which is consumed in the Eastern and Middle States, and as the average shrinkage of the wool clip is 60 per cent. and some wools shrink as high as 80 per cent., it will readily be seen that in some cases these freight

charges amount to 10 cents per pound on the clean wool. By establishing degreasing plants at the principal Western shipping points, millions of dollars' worth of wool fat and potash could be recovered annually, and from 60 to 80 per cent. of the freight charges, amounting to several millions of dollars more, could also be saved. Such a plan, if it were feasible, would have the further advantage of putting the wool on the market absolutely clean, free from further shrinkage and in the most perfect condition for working.

The most useful by-product of the woolen industry is undoubtedly woolen rags that may be reconverted into wool. Before these rags were used for this purpose, they were either thrown on the waste heap to become manure or collected and used for the production of Prussian blue and an inferior grade of paper. No waste of this kind is now permitted, but every woolen rag, in whatever form it may appear, unless completely worn out, is reused in manufacture, to appear again in clothing. Such rags are used and reused till there is absolutely nothing left of them that can be utilized, when they are mixed with hoofs, horns and the blood from slaughter houses, and melted with wood ashes and scrap iron for material out of which the beautiful Prussian blue is made.

Shoddy has been a part of the woolen manufacture since about the beginning of the 19th century, and its use is one of the necessary developments of the art of manufacturing, as, were it not for the supply from this source there would not be a sufficient amount of raw material to meet the demands for clothing, except at very much increased prices over those that exist today.

Shoddy is not woolen rags ground to powder, but rags that are picked, leaving a good staple suitable for spinning. Some of the most substantial goods that are made, doing serviceable work for a number of years, contain a proportion of shoddy mixed with wool.

The largest amount of shoddy is utilized in the woolen industry of Great Britain; next to which comes that of the United States, where in 1900 about 75,000,000 pounds were consumed, mostly in the manufacture of woolen fabrics.

**Wool Carding,** an early process in woolen manufacture for disentangling or tearing apart the tussocks of wool, and laying the fibers parallel, preparatory to the spinning.

**Woolley, Mrs. Celia (Parker),** an American author and minister; born in Toledo, O., June 14, 1848. She was pastor of the Unitarian Church at Geneva, Ill., for three years; of the Independent Liberal Church at Chicago (1896–1898); and wrote: "Roger Hunt"; "A Girl Graduate"; "Rachel Armstrong; or, Love and Theology."

**Woolly Indris,** or **Woolly Lemur,** the *indris laniger,* from Madagascar and the adjacent islands. The body is about 18 inches long, the tail two-thirds as much. The general tint is a more or less rusty brown, with a whitish band on the forehead.

**Woolly Rhinoceros,** the *Rhinoceros tichorinus,* probably the best-known form of the extinct rhinoceroses, specimens having been found imbedded in ice. The skin was without folds and covered with hair and wool; there were two horns, the anterior one being of remarkable size, and the nostrils were separated by a complete bony partition. The geographical range of the woolly rhinoceros was over the N. latitudes of Europe and Asia, but, unlike the mammoth, it did not cross Bering Straits. Its remains are first found in the Miocene.

**Woolman, John,** an American Quaker preacher and anti-slavery writer; born in Northampton, N. J., in August, 1720. His writings contain the earliest protest published in America against the slave trade. His works include: "Some Considerations on the Keeping of Negroes" (Philadelphia, 1753 and 1762); "Considerations on Pure Wisdom," etc. (1768); "Considerations on the True Harmony of Mankind," etc. (1770); "Epistles to Quarterly Meetings of Friends," etc. (1772). His "Journal of Life and Travels" was published in Philadelphia in 1775, and edited by Whittier, 1871. He died in York, England, Oct. 5, 1772.

**Woolner, Thomas,** an English sculptor; born in Hadleigh, Suffolk, England, Dec. 17, 1825; was educated at Ipswich. He was placed at the age of 13 in the studio of William Behnes; exhibited his first notable life-size group, "The Death of Boadicea" (1884); and followed up this success with "Puck," "Titania," and "Eros and Euphrosyne." Besides his well-known statues of Carlyle, Tennyson, Gladstone, Newman, Darwin, Kingsley, etc., his more celebrated works are: "Elaine with the Shield of Sir Lancelot," "Ophelia," "In Memoriam," "Virgilia Bewailing the Banishment of Coriolanus," and "Achilles and Pallas shouting from the Trenches." He was elected an A. R. A. 1871; R. A. in 1876. He also achieved considerable success as a poet in the volumes entitled "My Beautiful Lady" (1863), "Pygmalion" (1884); "Silenus" (1884); and "Tiresias" (1886). He died in London, Oct. 7, 1892.

**Woolsack,** the name given to the seat of the Lord Chancellor of England in the House of Lords, whose essential portion is a large square bag of wool without either back or arms, and covered with red cloth, the whole forming a kind of cushioned otto-

man, standing near the center of the chamber. It is believed that woolsacks were placed in the House of Lords in the time of Edward III. to remind the peers of the importance of England's staple trade. An Act of Henry VIII. directs that the Lord Chancellor, Lord Treasurer, or other high officer shall sit and be placed at the uppermost part of the sacks in the said Parliament chamber, either there to sit on one form or on the uppermost sack. D'Ewes says the Lord Keeper sat on the woolsack in 1559 when her majesty (Queen Elizabeth) was absent; the other woolsacks being as now allotted to the other judges. In 1621 it was declared in the standing orders of the House of Lords that "the Lord Chancellor sitteth on the Woolsack as Speaker to the House"—*i. e.*, not in his judicial capacity.

**Woolsey, Sarah Chauncey,** pen name SUSAN COOLIDGE, an American author; born in Cleveland, O., in 1845. She was a popular writer, especially for children. Some of her writings are: "The New Year's Bargain" (1871); "What Katy Did" (1872); "Verses" (1880); "A Guernsey Lily" (1881); "A Little Country Girl" (1885); and "A Short History of the City of Philadelphia" (1887). She edited: "The Diary and Letters of Mrs. Delaney"; and "The Diary and Letters of Frances Burney, Madame D'Arblay." She died April 9, 1905.

**Woolsey, Theodore Dwight,** an American educator; born in New York city, Oct. 31, 1801; was graduated at Yale College in 1820; studied law and later theology; was tutor at Yale in 1823–1825; licensed to preach in 1825; studied in Europe in 1827–1830; was Professor of Greek at Yale from 1831 to 1846; and then its president till 1871. In 1871–1881 he was president of the American company of revisers of the New Testament. Besides editions of Greek plays, etc., his works include an "Introduction to the Study of International Law" (5th ed. 1879); "Essays on Divorce and Divorce Legislation" (1869); "Political Science; or the State, Theoretically and Practically Considered" (2 vols. 1877); "Religion of the Past and of the Future" (1871); "Communism and Socialism" (1880); edited Lieber's "Civil Liberty and Self-Government" (1871) and a "Manual of Political Ethics" (1871). He died in New Haven, Conn., July 1, 1889.

**Woolson, Mrs. Abba Louisa (Goold),** an American lecturer and author; born in Windham, Me., April 30, 1838. She lectured on literary, social, historical, and dramatic subjects; and besides contributing to periodicals published: "Women in American Society" (1873); "Browsing among Books" (1881); "George Eliot and her Heroines" (1886); and "Dress as it Affects the Health of Women" (1874), a series of lectures.

**Woolson, Constance Fenimore,** an American novelist and poet; born in Claremont, N. H., March 5, 1848. Her principal books are: "Castle Nowhere" (1875); "Rodman the Keeper" (1880); "Anne" (1882); "For the Major" (1883); "East Angels" (1886); "Jupiter Lights" (1889); and "Horace Chase" (1894). She died in Venice in January, 1894.

**Woolston, Thomas,** an English Deist; born in Northampton, England, in 1669; entered Sidney Sussex College, Cambridge, in 1685; became a fellow, and took orders. The study of Origen and his allegorical interpretation of the Scriptures seems to have turned his head, and in 1705 he published the "Old Apology for the Truth of the Christian Religion against the Jews and Gentiles revived." Here Woolston maintained that Moses was only an allegorical personage, and all his history typical of that of Christ; that the miracles of the Pentateuch were allegorical, and the miracles attributed to Christ and the apostles pure allegory too; and he stigmatized as atheists and apostates all who received the Scripture narratives as literally, historically true. In subsequent publications he went further in the same direction; also maintaining that the Quakers approached more nearly in doctrine and organization to the primitive Church than any other religious body; and denouncing clergymen, because they made a profession of the pastorate, as "hireling priests," worshipers of the Beast, and ministers of Antichrist. In 1721 he published "The Moderator between the Infidel and the Apostate," dialogues tending to show that the Gospel miracles by themselves could not prove Christ to be the Messiah. This work occasioned great scandal, and it was only through the intervention of Whiston that the author escaped a prosecution. In 1721 his college deprived him of his fellowship. The views set forth in his last work Woolston developed more fully in "The Moderator between an Infidel and an Apostate" (1725), the former being Collins, the latter the modern Anglican clergy who had fallen away from the allegorical method of the Fathers and become priests of the letter. His famous series of six "Discourses on the Miracles of Christ" appeared from 1727 to 1729, with two "Defences" in 1729 and 1730. Here he maintained that Christ's miracles in themselves were open to the gravest doubts; that in fact the Gospel narratives, if they were to be taken literally, were only a tissue of absurdities; yet he loudly clamed to be a sincere Christian holding fast by the allegorical residuum of the miraculous history, and even Lechler takes him at his own valuation, but Trench, Strauss, and Cairns are more likely correct in counting this profession a mere blind. No less than 60 answers were made to the "Discourses"; but what was much worse,

an indictment for blasphemy was brought against the writer. He was tried before Chief-Justice Raymond at Guildhall, sentenced to be imprisoned for a year, to pay a fine of $500, and find securities to the amount of $10,000 that he would not repeat his offense. He was imprisoned in the King's Bench, and the remainder of his life was spent within its rules. Here he died, Jan. 21, 1731.

**Wool Thistle,** the *Carduus eriophorus;* stem much branched, furrowed, two feet hign; leaves semi-amplexicaul, but not decurrent, white and cottony, white beneath, pinnatifid, spinous and hairy, head very large, woolly, involucre globose; flowers pale purple, anthers blue. Young parts cooked and eaten as salad. Called also the woolly-headed thistle.

**Woolwich** (wöl'ich), a town and parliamentary borough of England, county of Kent, on the Thames, 8 miles below London Bridge. It stretches about 3 miles along the river, and owes its importance to the great arsenal, which has a circumference of 4 miles, and consists of gun and carriage factories, laboratory, barracks, ordnance departments, etc. At North Woolwich, on the opposite side of the river, many houses and extensive factories have of late years sprung up. The parliamentary borough, with a pop. (1901) of 117,165, sends one member to Parliament.

**Woolwich and Reading Beds,** in geology, a series of Lower Eocene beds formerly called the plastic clay. With the exception of the Thanet Sands they are the oldest English Tertiaries. They occur in England both in the London and Hampshire basins, the Thanet Sands underlying them in the former, but being absent from the latter area. In the London basin they are seen chiefly at Blackheath, Woolwich, and Reading. The strata consist of mottled clays and sand with lignite, and one horizon contains rolled flint pebbles derived from the chalk. The Woolwich and Reading beds are of fresh-water, estuarine, and a marine origin. An Eocene river flowed from the S. W. into the Thames at Woolwich, having in it various shells, Unios, Paludinas, Cyrenas, etc., with plant remains of Ficus, Laurus, etc. In the lowest beds, which are more marine, banks of oysters (*Ostrea bellovicina*) occur. The fauna comprises 72 genera and 123 species. Among them are turtles and a mammal (coryphodon). The plastic clay exists in the Paris basin, with the same remains.

**Woonsocket,** a city in Providence co., R. I.; on the Blackstone river, and on the New England, and the New York, New Haven, and Hartford railroads, 16 miles N. by W. of Providence. It contains a public library, churches of the principal denominations, a high school, Soldiers' Monument, fair grounds, waterworks, electric lights, National and savings banks, and daily and weekly newspapers. A bridge erected at a cost of $300,000 here crosses the river, besides numerous others. The city is the trading center of Northern Rhode Island and adjoining Massachusetts towns. The prosperity of the city is chiefly due to its industries. It has large manufactories of cotton cloth, woolen and worsted mills, rubber shoes factories, knit goods, wringers, mill and general machinery, boxes, harness pads, spools and bobbins. According to the United States census for 1900 there were 242 manufacturing establishments, employing $14,450,820 in capital and 8,093 persons; paying $3,080,280 for wages, and $7,563,204 for materials, and having a combined output valued at $15,627,539. The assessed property valuation is about $16,000,000, and the total debt, about $2,000,000. Pop. (1890) 20,830; (1900) 24,468; (1910) 38,125.

**Woorali Poison,** now generally called curara, obtained from the *Etrychnos toxifera,* and used by the South American Indians as an arrow poison. An alcoholic extract, called curara or curarin, is obtained from the crude woorali, which is in commerce a black-brown resinous mass, soluble in water, but slightly so in alcohol. The alcoholic extract, obtained by Roulin and Boussingault in 1828, was a solid transparent mass, of an excessively bitter taste, and possessed all the virulence of the woorali poison. The woorali poison contains no strychnine, but belongs to the narcotic rather than to the tetanic poisons. It is extremely virulent and rapid in its action, so much so that a large animal may be killed by a poisoned arrow in five minutes, and it may retain all its properties for an indefinite length of time if kept dry.

The physiological properties of the woorali poison have been investigated by numerous experimenters, such as Virchow, Münter, Bernard, Pelouze, Vulpian, and Kölliker, the last arriving at the following conclusions in 1857: (1) That the woorali poison causes death very rapidly when injected into the blood, or inserted into a wound; and that when introduced by way of the mucous membrane, its effects are slow, and require a large dose for their production; when applied to the skin of frogs is is inoperative. (2) It acts through the blood, and destroys the excitability of the motor nerves, while the sensory nerves are hardly at all affected. (3) When artificial respiration is carried on in animals under its influence, many of the secretions are increased owing to the paralysis of the vascular nerves, and the consequent dilatation of the vessels. (4) That in mammals the poison causes death by the paralysis of the respiratory nerves and suppression of the respiration, which brings on convulsions as a collateral effect.

There are two varieties, called corroval and vao, whose properties have been investigated by Weir, Mitchell, and Hammond. From a large number of experiments on living birds, mice, cats, frogs, and alligators, they find: (1) That corroval differs essentially from any variety of woorali hitherto described in its physiological results. (2) That it acts primarily on the heart through the medium of the blood, producing an arrest of the heart's action. (3) That the annihilation of voluntary and reflex motion is a secondary result of its action, depending primarily on the cessation of the heart's action. (4) That it acts on the nerves from the surface to the center, and abolishes both the sensory and the motor functions. (5) That is destroys muscular irritability. (6) That is paralyzes the sympathetic nerve, this being one of its primary effects. (7) That it is absorbed both from the intestinal canal and skin of frogs; and (8) that its poisonous effects are due to an alkaloid hitherto undescribed. They consider that vao is only a weaker variety of corroval, and that it is quite distinct from the ordinary woorali. Woorali or curara has been used in medicine in cases of hydrophobia and chorea; and disks, for use in hypodermic injection, have been prepared.

**Wooster,** a city and county-seat of Wayne co., O.; on Killbuck creek, and on the Pennsylvania and the Baltimore and Ohio railroads; 25 miles W. of Massillon. It is in an agricultural section. Here are Wooster University (Presb), the Ohio Agricultural Experiment Station, a high school, court house, electric lights, waterworks, National and other banks, and daily, weekly, and monthly periodicals. It has manufactories of doors, sashes, and blinds, carriages and wagons, paving brick, harness, furniture, flour, mill gearing, boilers, engines, pianos, etc., and an assessed property valuation of about $2,400,000. Pop. (1890) 5,901; (1900) 6,063; (1910) 6,136.

**Wooster University,** a coeducational institution in Wooster, O.; chartered in 1866; opened in 1870; under the auspices of the Presbyterian Church; has productive funds exceeding $700,000; grounds and buildings valued at over $745,000; scientific apparatus, etc., $15,000; volumes in the library, about 30,000; average number of faculty, 36; average students, 575; graduates, over 1,400.

**Wootz,** a very superior quality of steel, made in the East Indies, and imported into the United States and Europe for superior edge-tools. It is used in the manufacture of the celebrated sword blades of the East. Professor Faraday attributed its excellence to the presence of a small quantity of aluminium, but other analyses show no trace of aluminium. Wootz is believed to be made by a process direct from the ore.

**Wooyen, or Yuen,** the *Hylobates pileatus*, a gibbon, from a small island near Camboja. Little is known of the habits of this species, the individuals of which differ greatly in coloration at different periods of their lives. The young are uniformly of a dirty white; females white, brownish-white on back, with a large black spot on the head and chest; males black, back of head, body, and legs grayish.

**Worcester** (wö'ster), a city in Worcester co., Mass.; at the source of the Blackstone river, and on the Fitchburg, the New York, New Haven, and Hartford, the Boston and Maine, and the Boston and Albany railroads; 44 miles W. of Boston. It is built largely in a valley and on several hills, and comprises the villages of Summit, South Worcester, Trowbridgeville, Tatnuck, Quinsigamond, Northville, New Worcester, North Worcester, Leesville, Lake View, Jamesville, Greendale, Bloomingdale, Blithewood, and Barnardville. The city is well laid out with broad, regular, and well shaded streets.

*Business Interests.*— Worcester is said to manufacture a greater variety of articles than any other city in the United States. It has the largest wire works in the world, employing about 4,000 persons. Among other articles produced to a large extent are textiles, envelopes, shoes, cotton, and wool machinery, brussels carpets, woolen goods, machinists' tools, corsets, mowing machines, wood-working machinery, agricultural tools, and bicycles. There are 7 National banks in operation with a combined capital of about $1,900,000. In the year ending Sept. 30, 1901, the exchanges at the United States clearing house here were $74,397,774, an increase over the preceding year of $7,605,403. The city has many periodicals. The assessed property valuations are real estate, $88,053,500; personal property $25,269,600; total, $113,323,100. On Aug. 6, 1901, the total bonded debt was $9,859,000.

*Public Interests.*— Worcester has an area of 34 square miles; 188 miles of streets, of which 12 miles are paved; a system of waterworks costing $3,670,000, with 185 miles of mains, and an average daily consumption of 10,000,000 gallons; and a sewer system covering 158 miles. The streets are lighted by gas and electricity at an annual cost of over $121,000. The cost of the police department is about $142,000 per annum, and that of the fire department about $160,000. There is a public school enrollment of nearly 20,000 pupils, and annual expenditures for public education of nearly $530,000. The maintenance of the city government costs annually about $3,300,000. The city contains Clark University, Worcester Academy (Bapt.), the Worcester Polytechnic Institute, College of the Holy Cross (R. C.), Massachusetts State Normal School, and Highland Military Academy. The charitable institutions include the Iso-

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lation Hospital, City Hospital, Washburn Memorial Hospital for Women and Children, Worcester Insane Asylum for Chronic Cases, Worcester Lunatic Hospital, Hahnemann Hospital, St. Vincent's Hospital; Homes for the Aged, Orphans, and various others.

*History.*— Worcester was founded in 1674, but the settlers were soon driven away by the Indians. A second attempt was made to found a settlement in 1684, but after a few years the Indians again forced the whites to withdraw. The place was permanently established in 1713. It was incorporated in 1822, and chartered as a city in 1848. Owing to its central location in the State, and in a rich agricultural region it is known as the "Heart of the Commonwealth." Pop. (1890) 84,655; (1900) 118,421; (1910) 145,986.

**Worcester,** a city of Worcestershire, England — and itself also a county — on the Severn; 22 miles S. W. of Birmingham. It is a handsome town, mostly of red brick. The chief building is the Cathedral of St. Mary, built of red sandstone in the form of a double cross, and measuring 425 feet in length, 145 feet in width, and 193 in height. The predominant styles are Early English and Decorated. The cathedral, first erected (983), was rebuilt by Bishop Wulfstan (1084), and again (1281). Many alterations have since been made, and it has lately been elaborately "restored" at a cost of more than $500,000. It has a good tower with a clock and carillon of 12 bells, and contains the tomb of King John and of Prince Arthur, eldest son of Henry VII. The other principal churches are St. Helen's, St. Andrew's, St. Alban's, St. Martin's, all recently renovated; St. Nicholas's, entirely repaired in 1867; and Holy Trinity, erected in 1867. Other churches are St. Mary Magdalene (1876), and St. Margaret's Church (1874). Baptists, Methodists, Congregationalists, and Presbyterians have also several places of worship. Worcester has a guildhall, a grammar school, hop market, and elegant banks. Ruins of the castle and monastery of Worcester lie a short way S. of the cathedral. Glove-making has long been the staple industry of Worcester. The porcelain made here is also very famous for its delicacy and beauty of design. Iron foundries have existed from time immemorial, and tanning and rope making are carried on. Worcester, which dates from prehistoric times, was successively a British fort, a Roman camp, an English stronghold, and a bishop's see (from 680). Destroyed by the Danes, it was rebuilt by Ethelred, sacked by Hardicanute (1041), and frequently by the Welsh during the following two centuries. A new charter was granted by James I. in 1622, and Worcester espoused the royal cause throughout the great rebellion; here Cromwell achieved his "crowning mercy," Sept. 3, 1651. For its constant fidelity to the royal cause, Worcester received from Charles the motto still on the city arms, "*Civitas in bello et in pace fidelis.*" Pop. (1901) 46,623.

**Worcester, Dean Conant,** an American educator; born in Thetford, Vt., Oct. 1, 1866; was graduated at the University of Michigan in 1889; traveled in 15 of the Philippine Islands in 1887–1889; was instructor of animal morphology at the University of Michigan in 1893–1896, and became assistant professor in the latter year. In 1890–1892 he again traveled in the Philippines with Dr. F. S. Bourns, in a tour known as "the Menage Scientific Expedition." In January, 1899, he was appointed one of the United States commissioners to the islands to investigate and report on conditions there. In March, 1900, he was appointed a member of a Civil Commission, under the presidency of Judge William H. Taft, and composed, beside himself, of Luke E. Wright, of Tennessee; Henry C. Ide, of Vermont, and Prof. Bernard Moses, of California, to "continue and perfect the work of organizing and establishing civil government already commenced by the military authorities, subject in all respects to any laws which Congress may hereafter enact." Civil government was inaugurated at Manila, July 4, 1901, with Judge Taft as the first civil governor, and Dr. Worcester as Secretary of the Interior. Dr. Worcester was the author of "Preliminary Notes on Birds and Mammals collected by the Menage Scientific Expedition to the Philippine Islands" (1894); "Contributions to Philippine Orinthology" (1898); "The Philippine Islands and their People" (1898); and contributions to the elaborate "Report of the Philippine Commission" (1900).

**Worcester, Edward Somerset, Marquis of,** one of the earliest inventors of a steam engine; born about 1601. He was engaged in the service of Charles I. during the civil war, and was imprisoned in the Tower from 1652–1655. He afterward spent his time in retirement, and in 1663 published a book entitled, the "Scantlings of One Hundred Inventions," in which he first gave a description of the uses and effects of his steam engine. He died in 1667.

**Worcester, Joseph Emerson,** an American lexicographer; born in Bedford, N. H., Aug. 24, 1784. He was graduated at Yale in 1811, and very shortly began his life work as a dictionary maker. His first publication was: "A Geographical Dictionary, or Universal Gazetteer" (1817, revised 1823); followed by "Gazetteer of the United States" (1818); "Elements of Geography" (1819); "Sketches of the Earth and its Inhabitants" (1823); "Elements of History" (1826). In 1830 he published the

"Comprehensive Pronouncing and Explanatory English Dictionary (enlarged editions appeared 1847–1849–1855). In 1860 he published the great quarto, "Dictionary of the English Language" (illustrated), a standard authority wherever the English tongue is spoken. In 1820 he settled in Cambridge, Mass., and died there, Oct. 27, 1865.

**Worcester College,** a part of Oxford University; founded in 1714, out of the older Gloucester Hall, by Sir Thomas Cookes, for a provost, six fellows, and six scholars. At present there are 14 fellowships, 16 scholarships (of about $375 for five years), and 12 exhibitions. Of the fellows four, of the scholars five, must be sons of clergymen, needing support at the universities, and six of the remaining scholarships are for scholars of Bromsgrove School.

**Worcester Polytechnic Institute,** a technical non-sectarian institution in Worcester, Mass.; chartered in 1865 through the efforts of John Boynton, who started an endowment for it with $100,000; opened in 1868; offers courses in mechanical, civil, electrical, and electric railway engineering, chemistry, and general science.

**Worde, Wynkyn de,** an English printer; born probably in Lorraine. It is not known when he entered Caxton's service, but most likely it was at a very early age, as he was still living in 1535. In 1491 he succeeded to the stock-in-trade of his deceased master, but he did not append his name to his books till 1493. From about 1502 onward he worked in Fleet Street, London, at the sign of the Sun. He used on his books many varieties of Caxton's "mark," and Mr. Blades gives as many as 14 variant forms of his own name. Wynkyn de Worde made great improvements in the art of printing, and especially in that of type cutting. The books printed by him — 408 in number, according to the list in Diblin's edition (1810) of Joseph Ames's "Typographical Antiquities"— are generally distinguished by their neatness and elegance, hardly by their accuracy, nor, a few excepted, by the literary value of their contents.

**Worden, John Lorimer,** an American naval officer; born in Sing Sing (now Ossining), Westchester co., N. Y., March 12, 1818; was appointed a midshipman in the navy, Jan. 10, 1834. At the beginning of the Civil War he was captured by the Confederates, and after being held seven months was exchanged. He was ordered to the command of John Ericsson's "Monitor," which was armed with two 11-inch smooth-bore Dahlgren guns, carrying a shot of 168 pounds, and which left New York March 6, 1862. He arrived at Hampton Roads on the evening of the 8th, after the iron-clad "Merrimac" had destroyed the wooden frigates "Cumberland" and "Congress." On the morning of the 9th a memorable battle was fought by the "Merrimac" and "Monitor," the former of which was partly disabled and abandoned the fight, after several violent collisions with the "Monitor." He was promoted commander in 1862, captain in 1863; and commanded the iron-clad "Montauk" in the operations against Fort Sumter in April of that year. In June, 1868, he was promoted commodore, and in 1872 rear-admiral. He was superintendent of the Naval Academy at Annapolis in 1870–1874; commander-in-chief of the European squadron in 1875–1877; and was retired, at his own request, with full sea pay, Dec. 23, 1886. He died in Washington, D. C., Oct. 18, 1897.

**Wordsworth, William,** an English poet; born in Cockermouth, Cumberland, April 7, 1770. He was the son of an attorney and in 1787 was sent to St. John's College, Cambrige. He left the university after taking his degree, but without having otherwise distinguished himself, and lived aimlessly in London and elsewhere. He crossed to France in November, 1791, and exhibited vehement sympathy with the revolution, remaining in France for nearly a year. After his return, disregarding all entreaties to enter on a professional career, he published his "Evening Walk and Descriptive Sketches" (1793). Two years afterward he received a legacy of $4,500 from Raisley Calvert, a friend whom he had nursed in his last illness. With this sum and the consecrated helpfulness of his sister Dorothy he contrived to keep house for eight years, while he gave himself to poetic effort as his high "office on earth." For the first two years they lived at Racedown in Dorset where the poet among other experiments began his tragedy of "The Borderers." In this retreat they were visited (1797) by Coleridge, who had already recognized an original poetic genius in the author of "Descriptive Sketches." Coleridge was at this time living at Nether Stowey, in Somerset, and during this visit he induced the Wordsworths to go into residence at Alfoxden, in his immediate neighborhood. Here the two poets held daily intercourse, and after a year they published "Lyrical Ballads" (1798) in literary copartnership.

Though this volume was received with almost complete public indifference, yet Wordsworth felt that he had found his mission, and after a winter spent in Germany, he and his sister settled at Grasmere (1799), where he proposed to write a great philosophical poem on man, nature, and society. Thenceforth his life was marked by a few incidents. Those worth noting are his marriage in 1802 with his cousin Mary Hutchison; a removal from Grasmere to Allan Bank in 1808; his appointment in 1813 to an inspectorship of stamps, and his re-

moval to Rydal Mount; several journeys into Scotland and to the Continent; his acceptance of a D. C. L. degree conferred on him in 1839 by the University of Oxford; and his accession in 1843 to the laureateship on the death of Southey. Wordsworth's great philosophic poem, which, in his own phrase, was to be the Gothic cathedral of his labor, received only a fragmentary accomplishment in "The Prelude," "The Excursion," and "The Recluse." Yet enough was achieved in his smaller poems to justify his own conception of himself as a "dedicated spirit," and to set him apart among the greatest of England's poets. A complete edition of his poetical works has been published by Professor Knight, his prose writings have been collected and published by Dr. Grosart, his "Memoirs" were published in 1851 by his nephew, and an interesting account of the poet and his sister Dorothy is found in her "Diary of a Tour in the Highlands." He died in Rydal Mount, April 23, 1850.

**Work,** in physics, the act of producing a change of configuration in a system in opposition to a force which resists that change. For example, in raising a mass from the earth's surface, work is done in overcoming the attraction between the earth and the mass, *i. e.*, in opposition to the weight of the mass, and the work done is measured by the product of this weight into the distance through which it is overcome. To do this work, a certain force must be applied, a certain transformation of energy accomplished. The principle of work done is, indeed, a particular statement of the doctrine of the conservation of energy, and was clearly enunciated, as far as it concerns pure dynamics, by Newton in the scholium to the third law of motion. This scholium is thus paraphrased by Thomson and Tait (see their "Natural Philosophy," vol. i: 2nd ed. 1879): "Work done on any system of bodies has its equivalent in work done against friction, molecular forces, or gravity, if there be no acceleration; but if there be acceleration, part of the work is expended in overcoming the resistance to acceleration, and the additional kinetic energy developed is equivalent to the work so spent." Mathematically interpreted, this theorem is an explicit statement of the dynamical principle first formulated by D'Alembert in 1742, and still known by his name — a principle which enables us to write down the equations of motion for any system for which the equations of equilibrium have been investigated. Any alteration in the configuration of a material system indicates that work is being done on it by the forces to which it is subject. Hence, if $P$, $Q$, $R$, etc., be the forces acting on a system, and if $dp$, $dq$, $dr$, etc., be the corresponding minute displacements produced in the first instant of time by those forces acting unconstrainedly, then, since $Pdp$ represents the work which would be done by $P$ during this interval, and similarly for the others, the equation

$$Pdp + Qdq + Rdr + \text{etc.} = 0$$

is the condition that no work on the whole is done, and that the system is consequently in equilibrium. This is the so-called principle of virtual velocities, which Lagrange made the basis of his "Analytical Mechanics" and is also a part statement of the conservation principle.

**Work, Henry Clay,** an American song writer; born in Middletown, Conn., Oct. 1, 1832. He was highly popular in three different classes of songs: of the War, as "Kingdom Comin'," "Wake Nicodemus," "Babylon is Fallen," "Marching Through Georgia"; of temperance, as "Father, Dear Father, Come Home with Me Now"; sentimental, as "My Grandfather's Clock" and "Lily Dale." He died in Hartford, Conn., June 8, 1884.

**Workditch, The Picts'.** See PICTS' WORKDITCH.

**Workhouse,** in Great Britain, a house in which paupers are maintained at the public expense, those who are able-bodied being compelled to work. Under the old poor laws of England, there was a workhouse in each parish, partaking of the character of a bridewell, where indigent, vagrant, and idle people were set to work, and supplied with food and clothing, or what is termed indoor relief. These workhouses were described as, generally speaking, nurseries of idleness, ignorance, and vice; but a new system was introduced in 1834, parishes being now united for the better management of workhouses, which gave rise to the poor-law unions, with their workhouses. In these establishments the pauper inmates are employed according to their capacity and ability. Religious and secular instruction is supplied, while habits of industry, cleanliness, and order are enforced. In the United States similar establishments are called poorhouses.

**Working Drawing,** a drawing or plan, as of the whole or part of a structure, machine, or the like, drawn to a specified scale, and in such detail as to form a guide for the construction of the object represented.

**Working Party,** in the British army a body of soldiers told off for manual labor. When the work is necessary for military exigencies, such as the throwing up of works, clearing space for a camp, etc., no working pay is allowed; but when men are employed as artificers or laborers on permanent military works, roads, etc., they may, under the queen's regulations, be granted a small extra remuneration in addition to their ordinary pay.

**Workington,** a municipal borough and seaport of Cumberland, England, at the mouth of the Derwent; 7 miles N. of Whitehaven. Its harbor, furnished with a breakwater (1873) and several quays, is safe and commodious. To the coal mines in the vicinity the town chiefly owes its prosperity, great quantities of coal being exported; and there are large iron works and other industrial establishments here. A large Sheffield steel foundry was transferred hither, on account of the cost of transit to the seaside, in 1883. The salmon fishery near is important. Mary Queen of Scots landed here, on her flight from Langside, May 16, 1568, and was entertained at Workington Hall (the seat of the Curwens from about 1160 till the present day). Pop. (1901) 26,143.

**Workman, William Hunter,** an American traveler. He wrote: "Sketches Awheel in Modern Siberia"; (with his wife, FANNY BULLOCK WORKMAN), "In the Ice World of Himalaya" (1900).

**Worksop,** a town of Nottinghamshire, England, on the Ryton and the Chesterfield canal; 16 miles E. S. E. of Sheffield. It lies near the N. extremity of Sherwood Forest, in a district known as the "Dukery," from the number of ducal seats. There is Worksop Manor, in whose predecessor (destroyed by fire in 1761) Mary Queen of Scots was a prisoner under the Earl of Shrewsbury.

**World,** in the widest sense, the universe; the whole system of created things (as contradistinguished from God). In this sense the world, and facts and problems in regard to it, are discussed in ASTRONOMY: COMET: COSMOGONY; DARWINIAN THEORY: ETHER: SOLAR SYSTEM: STAR: (*q. v.*), and in many of the articles on philosophical and theological systems, such as NEOPLATONISM: PANTHEISM (*q. v.*). In the narrower sense it means the terraqueous globe, discussed in its physiographical relations in the article EARTH (*q. v.*). For the areas of the great land-divisions of the world, populations, topography, religion, divisions, etc., see the respective titles.

**Worldly Wiseman, Mr.,** a character in Bunyan's "Pilgrim's Progress," through whom is taught the inadequacy of reason and experience for gaining life's true ends.

**World's Columbian Exposition.** See EXPOSITIONS AND FAIRS.

**World Snake,** the *Midhgards-ormr,* an enormous serpent which, according to the Edda, lies in the deep sea, biting its own tail, and encircling the earth.

**World Tree,** a mythical ash (*askr Yggdrasils*), which in Scandinavian mythology is supposed to link hell, earth, and heaven together. Some writers see in this myth a distortion of the Story of the Cross, but the translator of Grimm says "it were a far likelier theory, that floating heathen traditions of the world tree, soon after the conversion in Germany, France, or England, attached themselves to an object of Christian faith just as heathen temples and holy places were converted into Christian ones."

**Wormeley, Katharine Prescott,** an American author, and translator; born in Ipswich, England, Jan. 14, 1830. She came to the United States in girlhood, and was engaged in the relief of Union soldiers during the Civil War. She is most widely known as a translator of Honoré de Balzac's novels (1883–1897), and of the Duc de Saint-Simon's "Memoirs" (1898–1901); and wrote: "The Other Side of War" (1881); "Life of Balzac"; "The United States Sanitary Commission" (1863). She died Aug. 4, 1908.

**Worm Gear,** in machinery, a combination consisting of an endless screw and spirally-toothed wheel; used for transmitting rotary motion from one shaft to another, placed at right angles to it.

**Worms,** a division of the animal kingdom, which may be taken to indicate (1) the class Annelida, the members of which have jointed bodies, and want true articulated appendages. Examples are found in (*a*) the order *Suctoria* or *Hirudinea,* including the leeches, etc.; (*b*) the *Oligochætæ,* represented by the earthworms; (*c*) the *Tubicola,* or tube dwellers, represented by the marine *Serpulæ* and *Sabellæ,* etc.; and (*d*) the *Errantia,* represented by the lob worm, the *Nereis, Eunice,* and other marine forms; (2) to such animals as the parasitic tapeworm (*Tæniada*), the nematoid worms, the thornheaded worms, and allied forms. A tapeworm differs from an ordinary worm in the compound nature of its body. Each "joint" or proglottis is a complete being having a set of generative organs. By many authorities the tapeworms and their neighbors, ranked with the *Echinodermata* as the division scolecida, are regarded as merely a lower branch of the annulosa. The following particulars may serve as a succinct account of the annelida or true worm. Two classes are included in the *Arthropoda;* namely, Class 1, gephyrea, ex. spoon worm (*Sipunculus*). Class 2, annelida, ex. earthworm (*Lumbricus*). Class 1 (Gephyrea).—In this class are included the various species of spoon worm (*Sipunculoidea*), small worm-like forms, which inhabit the sand of our coasts, or seek protection in the cast-off shells of certain mollusca. They exhibit the essential annulose characteristics, the body being segmented, and the nervous system consisting of the typical ventral gangliated cord. Lateral

Worms

appendages are wanting, as also are eyes and other organs of sense. A proboscis bearing the mouth, and surrounded by tentacles, is situated anteriorly, the posterior part of the body being comparatively thick and muscular. Class 2 (Annelida).— This class is as extensive as the preceding was limited. It includes the various kinds of worms. The body in general is distinctly segmented, each zone or segment being furnished with locomotive appendages. A detached segment of the body of a typical annelid consists of two halves or arcs, named from their position, the "dorsal" and ventral arcs. From the sides of each, certain processes, termed "paropodia" or "foot tubercles," arise, and of these, four exist to each segment, two borne by each arc of the segment. The tubercles on the dorsal arc are termed, from their position, "notopodia"; those of the ventral half, from their proximity to the nervous system, are known as "neuropodia." The terms "dorsal oar" and "ventral oar" are sometimes used synonymously with the above. Each "oar" or "parapodium" bears two distinct kinds of appendages: (1) bristles or "setæ," which form the bulk of the organ: (2) a soft tentacular filament, to which the name of "cirrhus" is applied. These organs materially assist locomotion. The head is generally differentiated from the other segments, and in many cases is furnished with eyes, antennæ, and similar organs. The digestive system includes a mouth — provided, in some instances, with a series of jaws — a stomach, and intestine. The respiratory organs consist of skin-sacs or pouches, or of branchiæ or gills; while in the lower forms breathing is performed by the general surface of the body. The nervous system consists of the typical gangliated chain, the anterior ganglia showing a tendency to coalesce together, so as to form a rudimentary "cerebral" mass or brain.

**Worms,** as a disease, frequently inhabit the intestinal canal in children, and often aggravate or even give rise to gastric and intestinal disorders, while the irritation which they produce is frequently propagated to the spinal cord, giving rise to convulsions or other formidable nervous symptoms. Though intestinal worms are more frequent in early life than in adult, no species of them are peculiar to infancy. The *Ascaris vermicularis,* or small thread worm, which inhabits the rectum, is very troublesome from the local irritation which it excites. The long thread worm, *Trichocephalus dispar,* inhabits the upper end of the large intestines, and frequently coexists with ascarides in the rectum. The *Ascarides lumbricodes,* or round worm, is much less common in the United States than the small thread worm. It dwells in the small intestines, and sometimes passes into the stomach, whence it is rejected by vomiting. The tapeworm — of which there are two varieties, the *Tænia solium* and *Tænia lata* — is seldom met with in children under seven years of age.

The small thread worms produce a most distressing itching and irritation about the anus, which is always most troublesome at night and frequently prevents the child from getting sleep. Sometimes they give rise to troublesome diarrhœa and tenesmus, or straining at stool, and in female children they may pass into the vagina and cause leucorrhœa. Round worms very frequently give no evidence of their existence, the expulsion of one by stool or by vomiting being often the first indication of their presence. It is commonly believed that children infested with lumbrici have inordinate appetites, as the worms subsist on the contents of the alimentary canal, and not on the juices of the lining structures themselves, as in the case of tapeworms. The irritation caused by the worm often produces troublesome diarrhœa, but this condition favors their expulsion. It occasionally happens that round worms pass from the stomach into the œsophagus, and from thence into the nostrils or larynx, and cause death. The irritation caused by worms frequently gives rise to violent convulsions and other cerebral symptoms. The symptoms of tænia or tapeworm are common to it and to the lumbrici; but the tapeworm is apt to produce a more decided impairment of the general health, and its symptoms are usually more persistent.

The different varieties of worms require different modes of treatment. Thread worms are scarcely affected by internal remedies taken by the stomach; but their destruction and expulsion is certain by the administration of medicated enemata. For this purpose lime water enemata may be given; or six ounces of lime water and two drachms of the tincture of the sesquichloride of iron. Küchenmeister, the greatest authority on helminthology, also recommends santonin in an enema in the proportion of from four to eight grains. For the expulsion of the round worms santonin in small doses is by far the safest and most efficacious remedy. For a patient six years old, two or three grains may be given at night followed by a full dose of castor oil in the morning, and this should be repeated two or three times in succession. Santonin has no effect on tapeworm; for the cure of which, as well as lumbrici, cusso, oil of male fern, or kamella, are the most effectual remedies.

**Worms,** a town of Germany, in Hesse-Darmstadt; three-quarters of a mile from the left bank of the Rhine, 40 miles S. S. E. of Mainz. It is irregularly built, and is still in part surrounded with its ancient walls. The principal edifice in the town is the venerable cathedral (founded in the 8th

century, completed and consecrated in 1101), a noble Romanesque structure with four elegant towers, two domes, and a double choir. The interior is 357 feet long, 87 feet wide (across the transepts 117 feet), and is very imposing from its grand simplicity. On the N. side of the cathedral is the site of the Bischophof or episcopal palace, the seat of the diet of April, 1521. It was destroyed by the French in 1689, and again in 1794. On its massive red sandstone substructure the Heil'sche Haus has been erected in the rich Renaissance style. Outside the town stands the Liebfrauenkirche (dating from the 15th century), which gives its name to the *Liebfrauenmilch*, a much-esteemed wine grown in the vicinity. The finest monument in Worms is that to Luther, erected from Rietschel's designs in 1868 at a cost of $85,000. The principal industries of Worms are the manufacture of patent leather, tobacco, beer, soap, and amber wares. Worms is one of the most historical towns of Germany. It was known to the Romans as Borbetomagus, and later as Augusta Vangionum, the capital of the Vangiones. It was destroyed by Attila and rebuilt by Chlodwig in 486. After the partition of the empire among the sons of Ludwig the Pious, Worms became a German free town under the protection of the Elector of the Palatinate. Already in 1255 it belonged to the Confederation of Rhenish towns, and it contained in the time of Friedrich Barbarossa 70,000 inhabitants. It was the seat of many Imperial Diets, most famous that under Karl V., which Luther made memorable to the world. In 1632 the suburbs of the town were levelled by the Swedish Colonel Haubold, and in 1689 the town itself was ruthlessly destroyed by Melac and the young Duc de Créqui under the orders of Louis XIV. In September, 1792, part of it was levelled by the French under Custine, and at the peace of Lunéville in 1801 it was given to France. The peace of Paris in 1814 gave it back to Germany, and the Vienna Congress in 1815 to Hesse-Darmstadt. Pop. (1905) 43,841.

**Wormseed,** a seed which has the property of expelling worms from the intestinal tube or other open cavities of the body. It is brought from the Levant, and is the produce of a species of *Artemisia* (*A. Santonica*), which is a native of Tartary and Persia. In the United States the name is generally given to the seed of *Chenopodium anthelminticum*. See ERYSIMUM.

**Wormseed Oil,** a pale yellow oil, obtained by distilling wormseed with water. It has a pungent odor, an aromatic, burning taste, sp. gr., 0.930, is slightly soluble in water, very soluble in alcohol and ether, and boils at 110°. In contact with air, it thickens and darkens in color, and, when heated with strong nitric acid, is converted into a resin.

**Wormwood,** in botany, the genus *Artemisia*; specifically, *A. absinthium*. The stem is one to three feet high, grooved, and angled; the leaves silky on both sides, twice or thrice pinnatifid, dotted; the yellow flowers in racemes, the heads drooping, silky, the outer flowers fertile. It is wild in North America in various waste places, also in Continental Europe, the North of Africa and Great Britain. It is a powerful bitter stomachic and tonic, useful in atonic dyspepsia, and to flavor drinks. It is also an anthelmintic (see ABSINTHE). The wormwood of commerce is derived from this species and *A. chinensis*. In entomology, a night moth, *Cucullia absinthii*, gray with black spots. The caterpillar feeds on wormwood, *Artemisia absinthium*.

WORMWOOD.

**Wornum, Ralph Nicholson,** an English writer on the fine arts; born in Thornton, Northumberland, England, Dec. 29, 1812. He became keeper and secretary of the National Gallery in 1855. He wrote: "Analysis of Ornament" (1856); "Sketch of the History of Painting" (4th ed. 1861); "Epochs of Painting" (1864); "Life of Holbein" (1867). He died in Hampstead, Sept. 15, 1877.

**Woronzoff, Michael Semenovitch, Prince,** a Russian statesman and general; born of an illustrious family in Moscow in 1782. He entered the Russian army in 1801, served against the Turks, and distinguished himself in the great war with France. He was severely wounded at Borodino and commanded the cavalry at the battle of Leipsic in October, 1813. Ten years later he was named governor of New Russia and Bessarabia, and in 1844 governor of the Caucasus. He carried on the war with the heroic mountain tribes, and took Shamyl's stronghold, Dargo. He died in Odessa in 1856.

**Worsaae, Jens Jakob Asmussen** (vor'-sâ-e), a Danish historian; born in Veile,

Jutland, March 14, 1821. He was director of the Museum of Northern Antiquities, Copenhagen, from 1866; minister of public worship in 1874–1875. He wrote: "Primeval Antiquities of Denmark" (1843); "Account of the Danes in England, Scotland, and Ireland" (1851); "The Danish Conquest of England and Normandy" (1863); etc. He died near Holbäk, Aug. 15, 1885.

**Worship,** a title of honor, used in addresses to certain magistrates, and others of rank or station; the act of paying divine honors to the Supreme Being; or the reverence or homage paid to him in religious exercises, consisting in adoration, confession, prayer, thanksgiving, and the like. The homage paid to idols or false gods by pagans; idolatry of inferiors. Obsequious or submissive respect; unbounded admiration; as, hero worship.

**Worsted,** a variety of woolen yarn or thread, spun from long-staple wool which has been combed, and which in the spinning is twisted harder than ordinary. It is knit or woven into stockings, carpets, etc. The name is derived from Worsted, a village in Norfolk, England, where it is supposed to have been first manufactured.

**Wort,** in chemistry, the saccharine extract obtained from malt, barley, and other grain, by mashing with water. It is a complex mixture of saccharine bodies, some existing in the grain and others formed in the process of brewing. It varies in quality, but the following percentage represents the average composition of brewer's wort, reckoned on the dry solid matter: Maltose, 64; dextrin, 16; cane and invert sugars, 12; albumen and mineral matters, 8.

**Wörth,** a village in Alsace, Germany; at the confluence of the Sauerbach and Sulzbach rivers; 10 miles S. W. of Wissemberg. It is celebrated as the place where the French on Aug. 6, 1870, met their first great defeat at the hands of the Germans in the Franco-Prussian War.

**Worth, Charles,** a French dressmaker; born in Bourne, Lincolnshire, England, in 1825. In 1846 he went to Paris, and started an establishment for the making of fashionable costumes. He was eminently successful as a designer of fashions, and his establishment became the leading emporium of fashion for Europe and the United States, employing 1,200 persons. He died in Paris, March 11, 1895.

**Worth, William Jenkins,** an American military officer; born in Hudson, Columbia co., N. Y., March 1, 1794. He received but a scanty education, and on the breaking out of the War of 1812, he entered the army as a private soldier. He was appointed 2d lieutenant of infantry in 1813, was aide-de-camp to General Lewis the same year, and General Scott in 1814; and the same year received the brevets of captain and major for gallant conduct at the battle of Chippewa, July 5, and at that of Lundy's Lane, July 25, at which latter he was severely wounded. He was promoted major in 1832, and colonel in 1838. In 1841, he assumed the command of the Florida war, which he brought to a successful termination after several severe conflicts. At the outbreak of the Mexican War, he joined the command of General Taylor, and distinguished himself at the storming of Monterey, for which he received the brevet of Major-General, and a sword from Congress. He also distinguished himself at Cerro Gordo, Puebla, Cherubusco, the capture of Vera Cruz, Molino del Rey, and in storming the San Cosmo gate of Mexico. At the close of the war he was placed in command of the Southwest. He was presented with a sword by the States of New York and Louisiana, and by his native county, besides a vote of thanks from Florida. He died in San Antonio, Tex., May 17, 1849. A monument was erected to his memory by the city of New York, where his remains are interred.

**Worth, William Scott,** an American military officer; born in Albany, N. Y., Jan 6, 1840; joined the Union army in 1861; was promoted 1st lieutenant June 7, 1861; captain, Jan. 14, 1866; lieutenant-colonel of the 13th Infantry, Nov. 26, 1894; and colonel in September, 1898. He accompanied the army to Cuba, and during the assault on San Juan Hill, July 1, 1898, was severely wounded. He was promoted Brigadier-General, U. S. A., Nov. 2, 1898, and retired. He died Oct. 16, 1904.

**Worthington, Henry Rossiter,** an American inventor; born in New York city, Dec. 17, 1817; early engaged in mercantile business with his father; but in 1840 began a series of experiments with steam for the propulsion of canal boats. Soon afterward he devised a small steam pump to be used in the maintenance of the water supply in the engine boiler, and in 1841 patented an independent feed pump which developed into the direct-acting steam pump that he patented in 1849. Subsequently he built in Savannah, Ga., the first direct-acting compound engine ever used in waterworks; erected a large plant for the manufacture of pumping machinery; invented the duplex pump, and devised various improvements in steam and hydraulic machinery. He died in Tarrytown, N. Y., Dec. 17, 1880.

**Wotton, Sir Henry,** an English diplomatist; born in Bocton Malherbe, Kent, England in 1568; was educated at Winchester and Oxford. He resided on the Continent for some years, and on returning to England was employed as secretary to Essex. On the fall of that nobleman from power

(1600) Wotton fled to Florence, where he was employed by the grand-duke to reveal to King James of Scotland a plot against his life. When the Scotch king ascended the throne of England he showed his gratitude by making Wotton a knight, employing him abroad as an ambassador and ultimately (1625) appointing him provost of Eton. His ability as a writer is shown in "Reliquiæ Wottonianæ (Wotton's Literary Remains), published in 1651, with Izaak Walton's "Life of Wotton." He died in Eton, in December, 1639.

**Woulfe's Bottle,** in chemistry, a bottle with two or more apertures, intended for the generation of gases or for cleansing the same by allowing them to pass through certain solutions contained in the bottle. The apertures are fitted with perforated corks through which are passed glass tubes arranged in the manner most suitable for the particular operation to which the bottle may be applied. The bottle was invented by and named after Peter Woulfe, a London chemist, who died in 1806.

**Wound,** a cut; a stab; a laceration; a breach of the skin and flesh of an animal, or of the bark and wood of a tree, or of the bark and substance of other plants, caused by violence or external force; injury; hurt. Injury; detriment; damage; as, a wound given to one's reputation.

In surgery, a solution of the continuity of a soft part of the body, effected by some external agent, and attended with a greater or les amount of bleeding. Wounds are of various kinds, and are generally distinguished is incised, lacerated, contused, and punctured. An incised wound is a simple division of the fibers made by a sharp cutting instrument. A lacerated wound is one in which the fibers, in place of being cleanly divided by a sharp instrument, are torn asunder by violence, the edges of the wound being in this case jagged and uneven. A contused wound is one made by a violent blow by some blunt instrument, the part being bruised as well as torn. A punctured wound is one made with a narrow pointed instrument, as a sword or bayonet. Wounds are dangerous, according to the extent of soft parts which they involve, the parts they occur in, and the state of health of the individual. In incised wounds the first thing to be attended to is to stop the hemorrhage. This is usually accomplished by simply bringing the edges of the wound together; but if any of the larger blood vessels have been injured, pressing the trunk, by means of a bandage or tourniquet, will be necessary; and should this not succeed, the vessels must be secured with ligatures. Next, care should be taken that all extraneous substances are removed from the wound. Then the edges of the wound are to be brought together, and retained either by straps of adhesive plaster, or in some situations by one or two stitches. Generally such wounds heal very quickly, without any suppuration taking place, or, as is it said, "by the first intention." When, however, this is not the case, and suppuration comes on, all attempts to procure union by the first intention should be abandoned, the plasters and bandages removed, poultices and warm dressings had recourse to to remove inflammation, and afterward healing ointment applied. Lacerated and contused wounds require to be similarly treated; but they heal less kindly, and suppuration almost always takes place. The swelling and inflammatory symptoms which commonly attend contused wounds are to be diminished by cooling lotions or emolient poultices. Punctured wounds are dangerous from their depth, and the internal effusion of serum and blood which usually attends them. They are frequently also followed by severe inflammation and suppuration. The same general principles apply in this case, too. Sometimes it may be necessary to enlarge the wound a little, so as to remove the stretching of the parts, and to lessen the inflammation, leeches and fomentations are often required.

In medical jurisprudence, the word wound is applied to any lesion of the body, referring not only to a solution of continuity, as in the common sense of the word, but also to every other kind of accident, such as bruises, contusions, fractures, dislocations, and the like.

**Woundwort,** a plant of the genus *Stachys* or betonica. It is about a foot high and rather slender. Stem erect, square, generally hispid backward on the angles, sometimes nearly smooth. Leaves smooth, membranous, generally rounded at base and acute at apex. Spike terminal, leafy, composed of verticels, each with 4–8 pale purple flowers. Variable in pubescence. It is found in fields and roadsides.

**Wouverman, Philips,** a Dutch painter; born in Haarlem, Netherlands, in 1619; studied under his father and his countryman Joh. Wynants. He painted landscapes, hunts, horse-fairs, cavalry skirmishes, fishermen and their boats, etc.; was particularly fond of introducing horses; and a white one is a characteristic of his works. All his pictures display a freedom, lightness, and naturalness that can hardly be surpassed. The best collection is in the Royal Gallery of Dresden. There are also fine examples in the Louvre, and in Munich, Vienna, St. Petersburg, Amsterdam, The Hague, Rotterdam, etc. He died in Haarlem, May 19, 1668.

**Wrack,** a general term for the larger kinds of seaweed cast ashore by the waves, and applied in a special sense to the species

of Fucus, which form the bulk of the wrack collected for manure, and formerly for making kelp. Most of the species are confined to the N. seas, and many grow in situations where they are more or less exposed at low water. The genus is distinguished by having flat or compressed forked fronds; air vessels when present formed by the occasional swelling of the branches, or in their substance; and receptacles filled with mucus, traversed by a network of jointed filaments. *F. serratus* (black wrack), *F. nodosus*, and *F. vesiculosus* (bladder wrack), are as common round the British coasts as grass in the fields. Oxen, sheep, and deer sometimes browse on wrack when other food is scarce.

PHILIPS WOUVERMAN.

**Wrangel, Friedrich Heinrich Ernst, Count** (vräng'el), a Prussian Field-Marshal; born in Stettin, April 13, 1784; joined a dragoon regiment; took a distinguished part in the campaigns of 1807, 1813, and 1814; and rose steadily till in 1848 he was general and commander of the Prussian and Federal troops in Schleswig-Holstein. In that year he marched into Berlin and crushed the insurrectionary movement there; in 1856 he became a Field-Marshal; in 1864 he had supreme command over Prussian and Austrian troops in the Danish War; and, ennobled in 1866, was still able to be present, though without command, with the Prussian army during the Austro-Prussian War. He died in Berlin, Nov. 1, 1877.

**Wrangel Land,** an island in the Arctic Ocean; lying N. of the E. extremity of the Asiatic coast, and intersected by the meridian of lon. 180° E. It was seen by the Englishman Kellett in 1849, again discovered by the American Long in 1867, and named after the Russian explorer Wrangel (1796–1870), who sought in vain to reach it in 1821–1823. It was first explored by the American expedition under Hooper and Berry in 1881. There seem to be other islands beyond it.

**Wrangler,** at Cambridge University, England, the name given to those who are placed in the first class in the first or elementary portion of the public examination for honors in pure and mixed mathematics, commonly called the Mathematical Tripos, those placed in the second class being known as Senior Optimes, and those in the third class as Junior Optimes. Up to and including the year 1882, the student who took absolutely the first place in the Mathematical Tripos used to be termed Senior Wrangler; those who came next to him being second, third, fourth, etc., wranglers. Since then the title has been given to the student who takes the first place in Part I. of the Mathematical Tripos. The name is derived from the public disputations, in which candidates for degrees were formerly required to exhibit their powers.

**Wrasse,** in ichthyology, any species or individual of the family *Labridæ*. Also any species or individual of the genus *Labrus*. The general form of the body resembles that of the perch, except that the back is straighter; there is a single long dorsal, and the ventrals are placed under the pectorals; coloration usually very brilliant; flesh of very little value for food. The wrasses frequent rocky shores, usually going in small shoals, and often concealing themselves under seaweed. They feed on small crustacea, mollusks, and marine worms. The young fish differ from adult specimens in having the præoperculum serrated.

**Wraxall, Sir Nathaniel William,** an English historian; born in Bristol, England, April 8, 1751; at 18 entered the East India Company Civil Service; but returned to England in 1772, and thereafter for nearly seven years traveled over Europe — even to Lapland, employed part of the time, however, in a confidential mission from Queen Caroline Matilda of Denmark to her brother George III. He published his "Cursory Remarks Made in a Tour" in 1775, his "Memoirs of the Valois Kings" in 1777, entered Parliament in 1780 as a follower of Lord North, but went over to Pitt, and was made a baronet in 1813. His next books were the "History of France from Henry III. to Louis XIV." (3 vols. 1795), "Memoirs of the Courts of Berlin, Dresden, Warsaw, and Vienna" (2 vols. 1799), and the famous "Historical Memoirs of My Own Time, from 1772 to 1784" (2 vols. 1815). For a libel in the last on Count Woronzov, Russian envoy to England, Wraxall was fined $2,500 and sentenced to six months' imprisonment, half of which he endured. Violent attacks on his veracity were also made by the "Edinburgh," the "Quarterly," and the

"British Critic," but Wraxall printed "Answers," on the whole, with success. He died in Dover, on the way to Naples, Nov. 7, 1831. His "Memoirs," continued from 1784 to 1790, was published in 1836 (3 vols.). There is an excellent edition of the whole work by Mr. H. B. Wheatley (5 vols. 1884).

**Wray, John.** See RAY.

**Wreath,** in ordinary language, something twisted or curled; a garland, a chaplet; an ornamental bandage to be worn on the head. In heraldry, the roll or chaplet above the helmet, on which the crest is usually borne. It is supposed to consist of the twisted garland of cloth by which the knightly crest was affixed or held to the helmet in mediæval times, and was formed of two colors, being those of the principal colors of the arms, which are twisted alternately. Wreaths may also be circular, but the straight wreath is the more common.

**Wreck,** the destruction of a ship by being driven ashore, dashed against rocks, foundered by stress of weather, or the like; shipwreck. Also the ruins of a ship stranded; a vessel dashed against rocks or land, and broken, or otherwise destroyed, or totally crippled or injured by violence or fracture; any ship or goods driven ashore, or found deserted at sea in an unmanageable condition; specifically, in law, goods, etc., which after a shipwreck have been thrown ashore by the sea, as distinguished from flotsam, jetsam, and ligan. Goods cast ashore after shipwreck are the property of the State, if not claimed within a year and a day.

**Wrede, Prince Karl Philipp** (vrā'de), a Bavarian Field-Marshal; born in Heidelberg, April 29, 1767; shared in the campaigns of 1799 and 1800, fighting at Hohenlinden, invaded Tyrol and took part in the battle of Wagram with the French, and was by Napoleon made a count of the empire. He led the Bavarian troops under Napoleon to Russia in 1812; then, changing sides with his country, commanded a united Bavarian and Austrian army against the French, by whom he was defeated at Hanau. He was, however, victorious in several battles on the sacred soil of France in 1814, and was made Field-Marshal and prince, with the gift of large estates. He represented Bavarian interests at the Vienna Congress in 1814. He died in Ellingen, Dec. 12, 1838.

**Wren,** a genus (*Troglodytes*) and family (*Troglodytidæ*) of birds, having a slender, slightly curved, and pointed bill; the wings very short and rounded; the tail short, and carried erect; the legs slender, and rather long. Their plumage is generally dull. They are abundant in the neotropical region, less common in the nearctic, palæarctic, and parts of the Oriental regions. They live on or near the ground, seeking for insects and worms among low bushes, and in other similar situations. The common or European wren (*T. parvulus, europæus,* or *vulgaris*) is found in all parts of Europe, and in Morocco and Algeria, and in Asia Minor and Northern Persia. In Central Asia it is represented by *T. pallidus.* In Iceland and the Faroes it is represented by *T. borealis,* and in the S. W. of Norway a species has been found, known as *T. bergensis.*

The common wren is more abundant in the N. than in the central and S. parts of Europe. It is a very small bird, only about

WREN AND NEST.

3½ inches long, reddish brown above, with narrow transverse bars of dark brown, yellowish white below, the greater wing coverts with three or four small bead-like spots of white. From its peculiarity of form, and its active, lively habits, it is one of the most familiarly known of British birds. It frequents gardens, hedges, and thickets. Its flight is not long sustained; it merely flits from bush to bush, or from one stone to another, with very rapid motion of the wings. It sometimes ascends trees, nearly in the manner of creepers. The male has a loud sweet song. The nest, which is comparatively large, is oval, domed above, with a small opening in the side, and is composed of leaves, hay or moss, sometimes lined with feathers, and generally of materials such that it resembles in color the objects beside it, and is not easily discovered. It is often placed under the thatch of a building, under the turf of a turf-topped wall, against the side of a moss-covered tree, or under an impending bank, always so as to be sheltered from rain. The eggs are usually from six to eight in number, and the male is assiduous in his attentions to the female in supplying her with food during incubation, and afterward assists her in the care of the young. Two broods are produced in the season. Imperfect nests, known as "cocks' nests," are often found near an oc-

cupied nest. In severe winter weather a number of wrens often take shelter together in an old nest, or in a hole of a wall; sometimes they roost in byres, to enjoy the warmth proceeding from the cattle. When driven from bushes, the wren is easily run down; and the hunting of the wren (the "king of all birds") on St. Stephen's or Christmas Day is an old custom in the S. of Ireland. A similar custom obtained on other days in other localities. Its origin is unknown. In general, however, the wren is almost as much a popular favorite in Great Britain as the redbreast. The name Kitty or Jenny Wren is popularly given to it in many parts of the country.

The North American species of wren are numerous; but many of them are ranked under different genera. The house wren (*T. domesticus* or *ædon*) is larger than the European wren, being about five inches long. It is reddish brown above, barred with dusky, and pale fulvous white below, with a light brownish tinge across the breast. It is abundant in the E. parts of the United States. It is less shy than the European wren, and often builds its nest near houses, and in boxes prepared for it. The nests are made to fill the boxes; and to effect this a large mass of heterogeneous materials is sometimes collected. The song of the house wren is very sweet. The male is a very bold, pugnacious bird, readily attacking birds far larger than itself, as the bluebird and swallows, and taking possession of the boxes which they have appropriated for their nests. It even attacks cats when they approach its nests. The winter wren (*T. hyemalis*) is so similar to the European wren that it is not easy to state a specific difference. It is common throughout North America, from Labrador to Louisiana, and partially migratory. Several other species, common in North America, all agree very nearly in their habits with the common wren.

**Wren, Sir Christopher,** an English architect; born in East Knoyle, Wiltshire, England, Oct. 20, 1632; was educated at Wadham College, Oxford; became a fellow of All Souls in 1653; was appointed Professor of Astronomy at Gresham College in 1657, and three years afterward was elected Savilian Professor of Astronomy at Oxford. He had been appointed by Charles II. to restore old St. Paul's, but after the great fire (1666) it became necessary to rebuild the cathedral. In preparing his plans he was considerably hampered by the ecclesiastical authority, but with the king's permission he modified and improved the design as the building proceeded. Thus, the division of the exterior into two orders of columns, and the present dome and drum on which it stands, were alterations on the original plan. The cathedral was begun in 1675, and the architect saw the last stone laid by his son 35 years afterward. Among the other notable buildings which Wren designed are: The modern part of the palace at Hampton Court, the library of Trinity College, Cambridge, the hospitals of Chelsea and Greenwich, the churches of St. Stephen's, Walbrook; St. Mary-le-bow; St. Michael, Cornhill; St. Bride, Fleet street; as also the campanile of Christ Church, Oxford. In 1680 he was chosen president of the Royal Society, appointed in 1708 surveyor of the royal works, and from 1685 to 1700 represented various boroughs in Parliament. He died in Hampton Court, Feb. 25, 1723. Over the N. doorway of St. Paul's is a memorial tablet on which are the well-known words: "*Si monumentum requiris, circumspice*" (If you demand a monument, look round). See SAINT PAUL'S.

**Wrench,** an instrument consisting essentially of a bar of metal having jaws adapted to catch on the head of a bolt or a nut to turn it; a screw key. Some wrenches have a variety of jaws to suit different sizes and shapes of nuts and bolts, and others, as the monkey wrench, have an adjustable inner jaw.

**Wrenning Day,** the name given in the S. of Ireland to St. Stephen's Day (Dec. 26), on which it was formerly the custom to hunt the wren and bear its body in procession from house to house, soliciting contributions toward the cost of a merry making. Various accounts are given of the origin of this custom, but as in Celtic mythology, the wren was regarded as having brought fire from heaven for the use of man, and as somewhat similar customs exist in many other places, it is probable that this hunting the wren had once a mystic meaning in connection with the great festive season of the first 12 nights of the sun's return from the winter solstice, and that the killing of the bird was originally sacrificial.

**Wren-tit,** the *Chamæa fasciata*, a small bird from the coast region of California. It was discovered and first described by Dr. Gambel, of Philadelphia, Pa., who gave it its popular name because it seemed to combine within itself the principal characteristics of the wren and the titmouse.

**Wrestling,** one of the most ancient forms of athletic exercise, and at one time the favorite pastime of the Greeks, especially during that period when Greece in civilization, military knowledge, and in the cultivation of arts and sciences stood head and shoulders above all the States of the civilized world. The Olympic Games, the great festival of the Greeks, which were instituted for the exhibition of various trials of strength and skill, included races on foot, and with horses and chariots, contests in leaping, throwing, boxing, and wrestling.

Wrestling

In the games described by Homer valuable prizes were offered, but after the 7th Olympiad a single garland of leaves of the wild olive was substituted at Olympia as the only meed of victory. One of the great objects of the old classical wrestlers was to make every attack with elegance and grace under certain laws of a most intricate nature, and the game is described by Plutarch as the hardest working form of athletics. In Devon and Cornwall, England, wrestling on the catch-hold principle still finds favor. In Lancashire they adopt a catch-as-catch-can style; while in Cumberland and Westmorland the ancient back-hold system con-

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tinues to hold its own. The Scotch have recently adopted a twofold mixture to be hereafter described; and in Ireland collar-and-elbow wrestling is the prevailing fashion. In the United States and Australia, in Germany, France, and Japan ground wrestling, which is the most objectionable of all known methods, is the most popular. This system has been dignified by the high-sounding title of Græco-Roman wrestling. The Græco-Roman style is practically the same as the French method, and consists of a struggle on the ground till one or other of the competitors is compelled through sheer exhaustion to give in; indeed, such a contest is simply an exhibition of brute strength. On commencing, the wrestlers take hold from the head and not lower than the waist, when both roll on the ground, and then the actual struggle begins. Tripping, which is the very essence of the game, is not allowed; therefore weight and strength are the only factors in the contest, which terminates when one of the combatants has been placed on both shoulders.

The Cornwall and Devon system is a perfect drawing-room entertainment in comparison with the foregoing style. The champions hailing from these two counties wrestle in strong loose linen jackets, and lay hold above the waist or by any portion of the jacket; and in order to be fairly thrown two shoulders and one hip must be on the ground, or two hips and one shoulder and a man must be thrown flat on his back before any other portion of his body touches the earth ere a decision can be given against him. Kicking is now forbidden, and the men usually wrestle in their stocking feet, which is a great improvement on the olden method when heavy boots shod with iron were used as a means of attack and defense. The Lancashire fashion allows unlimited action. The competitors are permitted to catch hold where they please, legs included, but they must not scratch or throttle or deliberately injure one another. Here again ground wrestling becomes a great factor in a struggle for supremacy. In fact, Lancashire wrestling much resembles what is called the Græco-Roman style, with other objectionable surroundings. Two shoulders on the ground constitutes a fall with 15 minutes' rest between each bout. The Cumberland and Westmorland method is probably the one now best known in England, and is still popular in such arenas as those at Carlisle, Grasmere, and other wrestling resorts in the N. counties. In the Cumberland and Westmorland style, when both men grasp each other round the body with the left arm above and the right underneath the play commences. Neither party is allowed to break his hold till the wrestle is over, and the one who touches the ground first with any part of his body, the feet of course excepted, is deemed the loser. If both fall together it is technically termed a "dog fall," and the men wrestle over again.

In the newly-adopted Scotch style of wrestling a commencement is made by taking hold in the Cumberland and Westmorland fashion with the arms round the body and the hands grasped in the well-known back-hold style. The tussle which ensues frequently lands one of the wrestlers flat on his back, and ends the contest before the struggle on the ground begins. If, however, a fair back-fall, with both shoulders down, does not result, then the bout is continued under Græco-Roman rules. In Ireland the collar-and-elbow system still holds good in a limited degree, and some years

ago frequent matches took place in the Phœnix Park, and at the Curragh at Kildare. The Irish style is simplicity itself. The competitors catch hold of the elbow with one hand and the collar with the other, and neither party is allowed to let go his hold till the fall has been gained. It is in some parts called henching, but cannot be considered a satisfactory mode of deciding a contest; yet it is useful in the case of sudden and unexpected attack, as the hold is easily obtained. The Swiss again compete in a special wrestling costume consisting of drawers, shirt, and a stout belt. A hold can be taken by the drawers alone, the shirt, or the belt, or by all at one and the same time according to the taste of the wrestler. There is no ground wrestling, and first man down loses in Switzerland, a much to be commended system. The French and Germans have their own fashion, but they so closely resemble the Græco-Roman and Lancashire style that the difference amounts to nothing. Practically ground wrestling is the practice in both countries, with two shoulders down to constitute a fall.

Wrestling has recently become popular in Japan and India. The Japanese have adopted the Græco-Roman style, and receive handsome rewards at the conclusion of their contests. The Jap wrestlers, who are a most formidable class of men, before entering the arena adorn themselves with a certain kind of war paint, with a huge belt round the waist and their enormous calves encased in stout leggings. The Indians, on the other hand, wrestle in bathing costume, and in a match only contest one bout, and one shoulder on the ground is deemed a fall. Such is a summary of the different systems of wrestling now before the public. In order to make the foregoing a little more explicit, let us recapitulate the various styles touched on, and the definitions of a fall appertaining to each. Græco-Roman, ground wrestling, two shoulders down to constitute a fall. Cornish and Devon, no ground wrestling, three points down, sometimes four points down as per arrangement. Lancashire, ground wrestling, two shoulders down, any hold. Cumberland and Westmorland, no ground wrestling, any point down. Scotch, ground wrestling, two points or shoulders down. Irish, first down to lose. Swiss, first down to lose. French, German, and Japanese, ground wrestling, two shoulders down. Indian, one fall, one shoulder blade down to constitute a fall.

Promoters of the sport have for years endeavored to introduce an amalgamated system on the catch-hold principle, not lower than the waist, in which the wrestler who first touches the ground shall be considered the loser, but success has not hitherto crowned their efforts.



**Wright, Carroll Davidson,** an American statistician; born in Dunbarton, N. H., July 25, 1840. After distinguished service in the Civil War, he was a member of the Massachusetts Legislature in 1871–1872; afterward chief of the State Bureau of Statistics, lecturer at Harvard University, United States Commissioner of Labor from 1885, and completed the 11th United States census; was Honorary Professor of Social Economics in the Catholic University of America (1895-1904); Professor of Statistics and Social Economics, Columbian University (1900); and president of Clark College, Worcester, Mass., from 1902. Works include: "Reports of Massachusetts Bureau of Labor" (15 vols. 1873-1888); "Census of Massachusetts" (1876-1877); "The Factory System of the United States" (1882); reports of the United States Commissioner of Labor, including "Industrial Depressions" (1886), "Convict Labor" (1886), "Strikes and Lockouts" (1887), and "Railroad Labor," "Outline of Practical Sociology" (1899); etc. He wrote much on social economy, and was an authority on statistics. He died Feb. 20, 1909.

**Wright, Elizur,** an American insurance expert; born in South Canaan, Conn., Feb. 12, 1804. He was graduated at Yale in 1826; taught school, and was Professor of Mathematics in Western Reserve College in 1829–1833. He was identified with the Anti-Slavery movement in 1833; was editor of the newspapers "The Emancipator," and "Human Rights," and the quarterly "Anti-Slavery Magazine." He published several works on life insurance, "Savings Banks Life Insurance" (1872), "The Politics and Mysteries of Life Insurance" (1873), etc.; and was insurance commissioner of Massachusetts. He wrote an introduction to Whittier's poems (1844); and published a translation in verse of "La Fontaine's Fables" (1859). He died in Medford, Mass., Nov. 21, 1885.

**Wright, George Frederick,** an American geologist; born in Whitelaw, N. Y., Jan. 22, 1838. He was a Congregational clergyman (1862–1872), and Professor of Harmony of Science and Revelation in Oberlin College. After 1884 he was connected with the United States Geological Survey. His works include: "The Logic of Christian Evidence" (1880); "Studies in Science and Religion" (1882); "The Relation of Death to Probation" (1882); "The Glacial Boundary in Ohio, Indiana, and Kentucky" (1884); "The Divine Authority of the Bible" (1884); "The Ice Age in North America"; "Man and the Glacial Period"; "Aspects of Christian Evidences" (1898); etc. He was editor of the "Bibliotheca Sacra" after 1884.

**Wright, Henrietta Christian,** an American writer for the young. Her works in-

clude the "Golden Fairy Series" (5 vols. 1883; published also as "The Little Folk in Green," illustrated, 1883); "Children's Stories of American Progress" (1886); "Children's Stories of the Great Scientists" (1888). She died in 1899.

**Wright, Horatio Gouverneur,** an American military officer; born in Clinton, Conn., March 6, 1820; was graduated at the United States Military Academy in 1841, and commissioned 2d lieutenant of engineers; for two years was instructor at the Military Academy; superintending engineer of the building of Fort Jackson, at Tortugas, Fla. (1846–1856); lighthouse engineer in Florida (1852–1853); assistant to the chief of engineers in Washington (1856–1861); promoted major, April 6, 1861. He served through the entire Civil War, with an exceptionally brilliant record for leadership; became Brigadier-General of volunteers, Sept. 14, 1861, and took command of the Department of Ohio in August, 1862; commanded a division at the battle of the Wilderness, May 5 and 6, 1864, and a corps at Spottsylvania Court House, May 9–12, and Cold Harbor, June 3; served as Major-General at the batttle of Opequan Creek, Sept. 19, 1864, and contributed to the decisive victory at Cedar Creek, Oct. 19, 1864; received the brevet of Major-General in the United States army for his services at the capture of Petersburg, March 13, 1865; mustered out of the volunteer service, Sept. 1, 1866; returned to regular army duty as lieutenant-colonel of engineers, becoming Brigadier-General and chief of engineers, June 30, 1879, which rank he held at his retirement, March 6, 1884. He was co-author of "Report on the Fabrication of Iron for Defenses," and died in Washington, D. C., July 2, 1899.

**Wright, John Vines,** an American jurist; born in Purdy, Tenn., June 23, 1828; took a medical course but afterward turned his attention to the study of law, and was admitted to the bar in 1852; was a member of Congress in 1855–1861. During the Civil War he served in the Confederate army, first as captain and later as colonel of the 13th Tennessee Regiment; won distinction at the battle of Belmont, where his horse was shot under him; was elected to the Confederate Congress, in which body he remained till the fall of the Confederacy. He then became a judge of the Circuit Court and afterward chancellor and judge of the Tennessee Supreme Court. In 1886–1890 he was chairman of the Northwest Indian Commission and concluded many treaties with Indians. He was defeated for governor of Tennessee in 1880. He died June 12, 1908.

**Wright, Mrs. Julia (McNair),** an American author; born in Oswego, N. Y., May 1, 1840. Her books are anti-Catholic in tone, and include: "Priest and Nun" (1869); "Jug-or-Not" (1870); "Saints and Sinners" (1873); "The Early Church in Britain" (1874); "Bricks from Babel" (1876); "The Complete Home" (1879); "A Wife Hard Won" (1882); "A Million Too Much"; "Tales for the New Century"; etc. She died in 1903.

**Wright, Mrs. Mabel (Osgood),** an American writer on nature; born in New York, in 1859. She wrote: "The Friendship of Nature," a series of outdoor studies; "Birdcraft," a book on New England birds; "Tommy-Anne: A Natural History Story"; "Citizen Bird," a book for beginners; "The Dream Fox Story Book" (1900); "The Flowers and Ferns in Their Haunts" (1901); etc.

**Wright, Thomas,** an English antiquary and historian; born near Ludlow, England, April 21, 1810. He was one of the founders of the British Archæological Association, and directed the excavation of Uriconium. A prolific worker, he wrote: "Queen Elizabeth and Her Times" (1838); "Essays on the Literature, Popular Superstitions, and History of England in the Middle Ages" (1846); "Narrative of Sorcery and Magic" (1851); "Wanderings of an Antiquary" (1854); "Essays on Archæological Subjects" (1861); "Manners and Sentiments in England During the Middle Ages" (1862); "Caricature History of the Georges" (new ed. 1868); "Womankind in Western Europe" (1869); "History of Caricature and the Grotesque" (2d ed. 1875); "The Celt, the Roman, and the Saxon" (5th ed. 1890); etc. He edited "Early English Poetry" (1836); "Piers Plowman" (1842); "The Chester Plays" (1843–1847); "The Canterbury Tales" (1847–1851); "Works of James Gillray" (1873); etc. He died in London, Dec. 23, 1877.

**Wright, William Aldis,** an English editor, noted as a Shakespeare scholar; born about 1836. He was the principal contributor in Biblical geography and biography to Dr. Smith's "Dictionary of the Bible" (3 vols. 1860–1863), and made an abridged edition. He edited Bacon's essays (1862), and his "Advancement of Learning" (1869); was coeditor with W. Clark, of the "Cambridge Shakespeare" (9 vols. 1863–1866), and the "Globe Shakespeare" (1 vol. 1864); and edited the "Bible Word-Book" (1866), Chaucer's "Clerk's Tale," the "Metrical Chronicle" of Robert of Gloucester, and other works.

**Wright, William Burnet,** an American clergyman; born in Cincinnati, O., April 15, 1836; was graduated at Dartmouth College (1857); pastor of Presbyterian churches in Chicago, Boston, and Buffalo. He wrote: "Ancient Cities from the Dawn

to the Daylight"; "The World to Come"; "Master and Men"; "The Sermon on the Mountain Practised on the Plain."

**Wrightia** (named after William Wright, 1740–1827, a Scotch botanist resident in Jamaica), the typical genus of *Wrighteæ;* calyx five-parted; corolla salver-shaped, the throat with 10 divided scales; stamens exserted; anthers sagittate; follicles distinct or combined. *W. tinctoria* is a small tree, a native of Rajputana and Central and Southern India. The seeds are said to be used in dyeing, and the leaves, with the seeds of *Cassia tora*, to yield an indigo color. *W. tomentosa*, a small, deciduous tree, growing in India and Burma, has a yellow juice, which, mixed with water, produces a permanent yellow dye. It is used by the Nepalese to stop bleeding, and the bark is given as an antidote to snake bite. *W. antidysenterica*, a small tree found in India and Burma, is a most valuable remedy for dysentery; the Arabs and Persians consider the seeds as carminative, astringent, tonic, and aphrodisiac. The tree furnishes conessi bark. The wood of *W. tinctoria*, *W. tomentosa*, and *W. mollissima* is used for carving and turning, and that of *W. coccinea* for making palanquins.

**Wrightine,** $C_{26}H_{42}N_2O$(?); a basic substance obtained from the pulverized seeds of *W. antidysenterica* by digesting with hot alcohol. It forms an amorphous powder, soluble in water, alcohol, and dilute acids; insoluble in ether and in carbon disulphide.

**Wrist Drop,** the hanging down of the hands by their own weight when the arms are outstretched. It arises from the paralysis of the extensor muscle of the hands and fingers, and often appears in lead-palsy.

**Wrist Joint,** in anatomy, the radio-carpal articulation formed between the radius and the triangular fibro-cartilage above and the scaphoid, semilunar, and cuneiform bones below. The superior surface is concave both transversely and from before backward, the inferior one is convex in both directions; the former is divided by linear elevations into three parts. It has an anterior, a posterior, and two lateral ligaments. The flexion is produced mainly by the radial and ulnar flexors of the carpus, its extension by the extensors of the carpus.

**Writ,** in law, a precept issued by some court or magistrate in the name of the government, the executive branch of the government, or that of the State or people of the State, vested with, in any case, the supreme authority, and addressed to some public officer or private person, commanding him to some particular act therein specified. Writs were divided into original and judicial. The former issued out of the Court of Chancery, and gave authority to the courts in which they were returnable to proceed with the cause; these writs are now abolished. Judicial writs are such as are issued in pursuance of a decree, judgment, or order of the court in which the cause is pending. The different kinds of writs were formerly very numerous, but many have been abolished. The most important are CAPIAS ERROR: HABEAS CORPUS: MANDAMUS: PROHIBITION: SUBPŒNA (*q. v.*), etc. There are also writs of election for members of Parliament, etc., addressed to the sheriff or other returning officer.

**Writers' Cramp** (sometimes called SCRIVENERS' PALSY), a condition which occasionally follows the overstraining of groups of muscles, and is met with among those who are engaged in occupations which require the exercise of particular voluntary muscles of the upper and lower extremities to an excessive degree; as editors, clerks, telegraphers, dancers, etc. After fatiguing and long-continued use of the pen, the hand may become at first tired; and afterward sharp pains may be felt running from the hand up the arm. Dull pains are also felt in the ball of the thumb, the dorsal aspect of the fingers, the wrist, and at the exposed portion of the ulnar nerve at the elbow. There is first impaired writing power, and afterward when the individual persists in his attempts, slight convulsive movements. The fingers, forearm, and wrist, more especially the three first fingers of the right hand, may lose power, though sensation is rarely lost or impaired. The same form of cramp affects the thumbs and fingers of telegraphers and the feet of the solo-dancers of the ballet; and a similar affection is met with among violin players, engravers, stenographers, typesetters, and cigar makers. Writers' cramp is more rare among those who write and meanwhile compose, than among clerks and copyists; and the condition is, therefore, the result of an over-developed automatism. The treatment of writers' cramp consists in cessation from the occupation which produced the affection, the administration of strychnia and iron, or conium; and excitation by electricity. Turkish baths are also efficient.

**Writers to the Signet,** an ancient society of solicitors in Scotland who formerly had the exclusive right to prepare all summonses and other writs pertaining to the Supreme Court of Justice. Under the 31 and 32 Vict. chap. 101 they have still the exclusive privilege of preparing crown writs. which include all charters, precepts, and writs from the sovereign or prince of Scotland. The office of Keeper of the Signet was in 1817 conjoined with that of Lord Clerk Register.

**Writing,** the act or art of forming letters and characters on paper, wood, stone,

etc., for the purpose of recording the ideas which the characters and words express, or of communicating them to others by visible signs. Anything written or expressed in letters; a book; a manuscript; any written composition; a pamphlet; an inscription.

Some traditions attribute the origin of writing to Seth, the son of Adam, and others to Enoch. It was most probably known in the antediluvian period. The remains of the Chaldæan temple-towers have inscriptions which show that the art of writing was known to that nation. Other authorities consider the system of hieroglyphics, which was invented by Athotes, or Thoth, about 2122 B. C., as the most ancient mode of writing. It is first mentioned in the Old Testament, Exod. xvii: 14. The Pelasgi are said to have introduced writing into Italy about 1476 B. C. The Romans practised running-hand as early as the 4th century, and introduced a knowledge of writing into their provinces. The belief was all but universal among the Greeks and Romans, that the Phœnicians were the inventors of letters, and that the knowledge of it was brought by Cadmus from Phœnicia into Greece, about 1500 B. C. From the Phœnician, therefore, or the Hebrew, with which it is closely allied, are incontestably derived: (1) The Oriental alphabets used in Asia W. of the Indus, written, like Hebrew, from right to left; the principal being the Syriac, Arabic, and Persian. (2) The Pelasgic, or original Greek alphabet, originally written, like the Phœnician and other Eastern languages, from right to left. It was afterward written consecutively from right to left, and from left to right, in the manner that land is ploughed. This procured for it the name of furrowed writing. This species of writing maintained its ground for a lengthened period. The laws of Solon, promulgated about 694 B. C., were written in it; and it was used till the 5th century B. C. But writing from left to right was introduced for a considerable period before the alternate or furrowed method was abandoned. Inscriptions dated 742 B. C. have been found written from left to right, or in the way now practised. From the Pelasgic alphabet were derived the Etruscan and Oscan. From the Ionic, a later variety of the Greek, came the Arcadian, the Coptic, the Ethiopic, the Mœso-Gothic, and Runic, and in comparatively modern times, the Armenian, Illyrian, Sclavonic, Bulgarian, and Russian. With regard to Greek writing, it is to be observed that the most ancient mode was capitals. The small letters now in use seem to have been introduced gradually; for in our oldest Greek MSS., even so early as the 5th century, they appear intermixed with capitals. But the latter were principally employed till the 7th or 8th century. (3) The Latin alphabet is also derived from the Ionic-Greek. In the earliest inscriptions which we possess, the forms of the letters scarcely differ from those in use at the present day; but great varieties have been in subsequent times introduced; first, in the ordinary method of writing it; as, the Uncial, Semi-Uncial, Lombard, Italic, etc. Secondly, in the number and form of the letters contained in the numerous alphabets derived from it. (4) A fourth class of alphabetical languages consists of the Sanskrit and its derivatives. These are very numerous, and are spoken in the continent and islands of India. The antiquity of the Sanskrit alphabet is undoubtedly great; but those who assign to it a separate origin are probably in error. Indeed, the great regularity of the Devanagaree, or most elegant form of the Sanskrit alphabet, and its copiousness (it contains 100 letters) seem to afford strong presumption that it was compiled by some learned individual or body (like the Russian and other modern Western alphabets), from other forms of writing then in use, and imported into India from the West. The Sanskrit and its derivative languages are written, like European, from left to right. These four classes comprehend all the alphabetical languages in existence. The following table exhibits the number of letters in some of the principal:

| | |
|---|---|
| Class 1. | Hebrew, Samaritan, Syrian, and Chaldean, 22 each. Phœnician (known) 17. Arabic, 28. Persian, 32. |
| Class 2. | Greek, 24. Armenian, 38. Ethiopic or Abyssinian, 202. Modern Russian, 41. |
| Class 3, | (which is only a subdivision of Class 2). Latin, 22. English, 26. French, 28. Italian, 20. German, 26. |
| Class 4. | Sanskrit (Devanagaree), 100. See ALPHABET. |

**Writing Ball,** an electric printing apparatus, consisting of a half-sphere of gun metal, resting with its convex side upward on a frame, and pierced with radial apertures to the number of 52, in which work pistons, converging to the center. Each piston is ground off horizontally at its bottom, on which is engraved a letter, figure, or punctuation mark. The pistons are worked by the fingers, and when depressed are raised by spiral springs.

**Writing Frame,** a device for the blind; consists of a frame in which a sheet of paper may be placed, and a horizontal straight edge, which forms a guide for the hand in making a row of letters. The line being completed, the straight edge is lowered one notch, and forms a guide for the next line, and so on.

**Wroeites,** the followers of John Wroe, who died in Australia on Feb. 6, 1863. They arose about 1823. In 1859 appeared their symbolical work, entitled "The Life and Journal of John Wroe, with Divine

Communications to Him." They are also called Christian Israelites.

**Wrongous Imprisonment,** in Scotch law, the illegal detention of the person either through violent seizure or through a breach of the rules that regulate legal procedure. The individual thus wrongously imprisoned has redress both at common law and by special statute.

**Wryneck,** any bird of the genus *Iunx* or *Yunx;* specifically, *I. torquilla,* the common wryneck; length about seven inches; general color of upper parts, including the tail, grayish-white, mottled all over with brownish-gray, and obscurely barred and streaked with dark-brown wings, brown barred with dull chestnut on the outer webs

WRYNECKS.

of the feathers; under parts buff, each feather with a narrow dark-brown spot near the tip. Little or no variation in the female. It feeds on caterpillars and other insects, and is often seen near ant hills in search of the cocoons, popularly known as "ant's eggs." The construction of the protusile tongue resembles that of the woodpecker, and the organ is furnished with glands secreting a glutinous mucus which causes the prey to adhere to its horny tip. The wryneck rarely makes a nest, or at best but a very poor one, usually depositing its eggs in some hole in a tree. The name wryneck is derived from the bird's habit of writhing its head and neck in various directions with a serpentine motion. It has a number of other popular names, as cuckoo's mate, turkey bird, and is probably the hobby bird of Browne. His description, "marvelously subject to the vertigo," refers, in Seebohm's opinion, to the wryneck's habit of feigning death when taken; while Wilkin thinks it is founded on the "singular motion of its head and neck." The actual habitat of the bird is Central Europe and Asia.

**Wulfenite** (after the Austrian mineralogist, Wulfen), a mineral occurring mostly in crystals; system, tetragonal; hardness, 2.75–3; sp. gr., 6.03–7.01; luster, resinous to adamantine; color, shades of yellow, siskin and olive green, sometimes orange or bright red; composition: Molybdic acid, 38.5; protoxide of lead, 61.5 = 100, corresponding with the formula $PbOMO_3$. The orange and red colored varieties owe their color to the presence of vanadic acid.

**Wulfila.** See ULFILAS.

**Wu-chang.** See HANKOW.

**Wulfstan.** See WULSTAN.

**Wulstan,** or **Wulfstan,** the name of several notable persons, among them (1) a monk of Winchester in the 10th century, author of a Latin prose life of Bishop Ethelwold, and a poem in Latin hexameters on the Miracles of St. Swithin. (2) An Archbishop of York, in 1003, author of two pastoral letters and several homilies in Anglo-Saxon, the most remarkable of which is printed in Hickes's "Thesaurus," vol. iii. (3) The well-known Bishop of Worcester, and a saint of the English calendar. He was born in Icentun in Warwickshire about 1007, and educated at Evesham and Peterborough. He became a priest, afterward a monk and prior of the monastery of Worcester, and ultimately in 1062 bishop of that see. He lived through the troubles of the Norman Conquest, enjoyed the favor not only of the Conqueror, but of William Rufus, and died in 1095, at the age of 87. He is by some reputed the author of the portion of the Anglo-Saxon Chronicle which extends from 1034 to the death of the Conqueror. His "Life" was written by William of Malmesbury.

**Wundt, Wilhelm Max** (vönt), a German physiologist and philosopher; born in Neckarau, Baden, Aug. 16, 1832. He was Professor of Philosophy at Leipsic after 1875. His works include: "Science of Muscular Motion" (1858); "Manual of Human Physiology" (4th ed. 1878); "Ethics" (2d ed. 1892); "The Human and the Animal Soul" (2d ed. 1892; in English, 1894); "Logic" (2d ed. 1892–1895); "Elements of Physiological Psychology" (4th ed. 1893); "System of Philosophy" (2d ed. 1897); "Outline of Psychology" (2d ed. 1897; in English, 1894); etc. As a physiologist he advanced psychology by his work. As a philosopher he introduced the inductive method into sciences previously purely speculative (*e. g.,* logic and ethics), and sought to advance pscyhology by exact measurements (as of the time needed by a nerve stimulation to reach consciousness and become a percept).

**Wupperthal,** the busiest and most densely-populated valley of the German empire, receives its name from the winding Wupper or Wipper. By Wupper is sometimes understood only the district between and embracing Barmen and Elberfeld, which, since the intervening 4 miles of road are

lined continuously by houses and factories, have come to be regarded as a single town. Oftener, however, it is extended to the entire basin of the Wupper and its tributaries, and so comprises Remscheid, Lüttringshausen, Solingen, Höhscheid, Merscheid, Lennep, etc. The people are occupied chiefly in spinning, weaving, bleaching, dyeing, and iron founding.

**Wurdha,** or **Wardha,** the chief town of the district of the same name, Central Provinces, British India; on the left bank of the Wurdha river, 40 miles S. W. of Nagpur and 471 E. of Bombay. It was founded in 1866; but as a station on the railway it has already become a center of the cotton trade. The district, which was formed out of Nagpur in 1862, has an area of 2,401 square miles. The staple crops are millet, cotton, wheat, and rice. Here is produced the well-known Hingunghat cotton, which is exported to the amount of 25,000 bales a year. The breed of cattle is good, especially the trotting bullocks. The railway now crosses the center of the district. The Wurdha river rises in the Satpura hills, and flows S. E. for 254 miles to join the Weingunga; the united stream, under the name of the Pranhita, ultimately falls into the Godavery at Sironcha.

**Wurno,** a town of the Central African State of Sókoto, Northern Nigeria; on the river Sókoto, 18 miles N. E. of the town of that name. It has a considerable trade in cotton, corn, and kola nuts.

**Wurora,** or **Warora,** a town in the district of Chanda, Central Provinces, British India; on the left bank of the Wurdha river; 28 miles S. E. of Wurdhatown. Here is one of the largest coal fields in the peninsula. A shaft has been sunk, which passes through a coal seam 15½ feet thick at a depth of 176 feet, and a little lower through another seam 11 feet thick. It is estimated that the field may afford an output of 100,000 tons per annum for 100 years. A narrow gauge line (46 miles long) has been laid down to Wurora from Wurdha station on the Great Indian Peninsula Railway.

**Wurrus,** or **Waras,** a powder sold in African bazaars as an anthelmintic and a dye plant. It was long believed to be identical with kamala, but it has been shown by Captain Hunter, assistant resident at Aden, that wurrus consists of the glandular hairs on the legumes of *Flemingia congesta.*

**Würtemberg,** or **Württemberg** (vür-tem-berg), a kingdom of the German empire, between Bavaria, Baden, Hohenzollern, and the Lake of Constance, which separates it from Switzerland; area, 7,533 square miles; pop. (1905) 2,302,179. Except a few tracts in the S., the surface is hilly and even mountainous. In the W., the Schwarzwald, or Black Forest, forms part of the boundary, and the Alb or Rauhe Alp, forming part of the Franconian Jura, covers an extensive tract. The country belongs in large part to the basin of the Rhine, being drained N. into that river by the Neckar, while the Danube flows across the S. districts. A part of the Lake of Constance is also included in Würtemberg. The climate is decidedly temperate. In the lower and more favorable districts the fig and melon ripen in the open air, and the vine, cultivated on an extensive scale, produces several first-class wines; maize, wheat, hops, tobacco, and fruit, which is employed in cider making, are largely cultivated. About a third of the country is under forests, which consist chiefly of oaks, beeches, and pine. Of minerals, by far the most valuable are iron and salt, both of which are worked by the government; the others are limestone, gypsum, alabaster, slate, millstones, and potter's clay. The manufactures consist chiefly of cotton, woolen, and linen goods, paper, wooden clocks, toys, musical instruments, and chemical products. The government is an hereditary constitutional monarchy, the executive power being lodged in the sovereign, and the legislative jointly in the sovereign and a Parliament, composed of an upper and a lower chamber. The latter, which is elected every six years, is composed of 93 members. The total revenue for the year ending March 31, 1901, was 82,222,006 marks, and on April 1, 1900, the principal of the public debt was estimated to amount to 498,068,800 marks. In the Bundesrath Würtemberg is represented by four members, and in the Reichstag by 17. There is no exclusively established religion, but the king is invested by the constitution with the supreme direction and guardianship of the Evangelical Protestant Church. Education is generally diffused; the center of the educational system is the University of Tübingen, which in the winter half-year 1899–1900 had 104 professors and teachers, and in the summer half-year 1899, 1,525 students in theology, jurisprudence, medicine, and philosophy. Besides Stuttgart (the capital), the chief towns are Ulm, Heilbronn, and Esslingen.

The history of the state is of little general interest. Previous to the Napoleonic era the rulers had the title of duke, but in 1806, by the favor of Napoleon, the then duke gained a great accession of territory, as well as the title of king. In the subsequent arrangement of the European States by the Congress of Vienna the territorial accessions were confirmed and the kingly title formally recognized. In the war of 1866 Würtemberg sided with Austria against Prussia. It became a member of the German empire on its foundation in 1871.

**Würzburg** (vürts'börg), a town in the N. W. of Bavaria, Germany; on the Main; 60 miles S. E. of Frankfort. Its old fortifications have been demolished, and the site laid out in fine promenades, but it is still overlooked by the fortress of Marienberg, on a lofty hill outside the city. The most important edifices are the Romanesque cathedral, erected in the 10th century, with an interior highly enriched but much deteriorated by plaster decoration of the 18th century; the university, with various new buildings; the Julius hospital and school of medicine, and the royal palace (1720–1744). The university in the winter half-year 1899–1900 had 88 professors and teachers, and in the summer half-year 1899, 1,214 students in theology, jurisprudence, medicine, and philosophy; the library has 200,000 volumes, and in other respects the university, especially in the medical faculty, is well equipped. The manufactures are varied in character. Pop. (1905) 80,327.

**Wu Ting-Fang,** a Chinese diplomatist; born in Hsin-hui, district of Kwangtung, China; studied Chinese literature and classics together with English in Canton, and took a law course in England in 1874–1877. On his return to China he directed the construction of the first railroad in his native land; was the first secretary of the Chinese commission to negotiate with Japan in 1895; and was afterward a plenipotentiary to ratify the treaty. He was envoy extraordinary and minister plenipotentiary to the United States, Peru, and Spain in 1897-1902, and to the United States alone in 1907-1909. For several years he was engaged on a codification of Chinese criminal and civil laws. In 1900 the degree of LL.D. was conferred on him by the University of Pennsylvania.

**Wurtzite** (after the French chemist, Adolphe Wurtz), a dimorphous form of blende; crystallization, hexagonal, being isomorphous with greenockite; hardness, 3.5–4; sp. gr., 3.98; luster, vitreous; color and streak, brownish to brownish-black. Found crystallized near Oruro, Bolivia. Breithaupt states that the radiated (cadmiferous) blende of Przibram, Bohemia, is hexagonal in crystallization; spiauterite.

**Wuttke, Emma** (vöt'ke), a German novelist, wife of Heinrich Wuttke; born in Breslau, March 7, 1833. Her home was at Dresden. She became known under her maiden name, E. Biller, as a writer for the young. After marrying, she wrote the successful historical romances: "Barbara Ittenhausen" (6th ed. 1896); "Barbara of Brandenburg" (2d ed. 1896); "Under the Governess's Sceptre" (1888); "Duty" (1896); etc.

**Wuttke, Heinrich,** a German historian and politician; born in Brieg, Silesia, Feb. 12, 1818. He was professor at Leipsic (1848), and a member of the National Assembly; in the latter capacity he was a founder and prominent representative of the "Great German" party. He wrote: "King Frederick the Great" (1842–1843); "Poles and Germans" (1847); "The Battle of Leipsic" (1863); "German Periodicals and the Formation of Public Opinion" (3d ed. 1876); etc. He died in Leipsic, June 14, 1876.

**Wyandotte** (in Canada called Huron), an Indian tribe in North America belonging to the Iroquois family. In the beginning of the 17th century they were settled on the E. shore of Lake Huron, but in a tribal war (1636) they were nearly exterminated. Part of the dispersed tribe settled at Ancien Lorette in Lower Canada, where their descendants still remain. Only a small number are now settled on Indian reservations in the United States.

**Wyandotte Cave,** in Indiana, excels the Mammoth Cave in the number and variety of its stalagmites and stalactites, and also in some of its chambers, one being 350 feet long and 245 feet wide, containing a hill 175 feet high. This stupendous work of nature abounds in long avenues, pillared palaces; Monument Mountain, rising 175 feet high, while 75 feet above its crest stretches away the Grand Dome; the Pillar of the Constitution, an immense stalagmite. 75 feet in circumference and 30 feet high, which is without a parallel in the world. The cave has been explored for 23 miles, and there are many passages which have never been traversed. See STALACTITES.

**Wyant, Alexander H.,** an American landscape painter; born in Port Washington, O., Jan. 11, 1836. He studied at Carlsruhe, Düsseldorf, and London, and made attractive studies in Ireland of the lakes of Killarney. His studies of autumn effects in American forests, and views of nature in the Adirondacks and along the Ohio river, made his fame more than continental. He died in New York city Nov. 29, 1892.

**Wyatt, Sir Mathew Digby,** an English architect; born in Rowde, near Devizes, England, in 1820; after studying at the Royal Academy, he made a diligent study of the architecture of Italy, France, and Germany, returning to England in 1846 to publish his "Geometrical Mosaics of the Middle Ages" (1848). As secretary to the Royal Commissioners he took an important part in the arrangements of the 1851 Exhibition. In 1856 he was appointed architect to the East India Company; in 1866 awarded the royal gold medal of the Royal Institute of British Architects; and in 1869 knighted and chosen Slade Professor of Fine Arts at Cambridge. His chief books are "Metal Work and its Artistic Design" (1852);

"Industrial Arts of the Nineteenth Century" (1853); "Art Treasures of the United Kingdom" (1857); "Fine Art" (1870); "Architect's Handbook in Spain" (1872). He died May 21, 1877.

**Wyatt, Sir Thomas,** an English courtier and poet; born in Allington Castle, Kent, England, in 1503; son of Sir Henry Wyatt, who stood high in favor with Henry VII., and later with his son. In 1515 he was entered at St. John's College, Cambridge, where he took his degrees of Bachelor and Master of Arts. He was warmly received at court, for he was one of the most accomplished men of his day, of a noble presence and fine manners, dexterous and subtle in the management of affairs, yet of spotless honor and integrity. In 1536 he was knighted, and the next year he was made high sheriff of Kent. He contrived to retain the hazardous favor of the king, and was frequently employed by him in positions of trust, as in missions to Spain, to the imperial court. In 1541 he was rewarded with a grant of lands at Lambeth, and the year after he was named high steward of the king's manor at Maidstone. He had now very much withdrawn himself from public life, and lived for the most part retired at Allington. Among the other accomplishments of Wyatt was that of verse, which he seems to have begun to cultivate early, and continued through life to practise. During his life he had acquired considerable reputation as a poet; and in 1557 his poems, with those of Surrey, were published in "Tottel's Miscellany" (ed. by Arber, 1870). As marking a stage in the progress of early English literature they hold a permanent place. He died in Sherborne, Oct. 11, 1542.

**Wyatt, Sir Thomas,** surnamed THE YOUNGER (to distinguish him from the preceding, of whom he was the only son), an English soldier; born about 1520. After a wild and riotous youth, he raised a body of men at his own expense, and did good service at the siege of Landrecies (1544), displaying considerable military talent; and he continued in honorable service on the Continent till 1550. In 1554, when the Spanish match was in agitation, Wyatt, in coöperation with Lady Jane Grey's father, led the Kentish men to Southwark, after gaining considerable successes over the royalists; but failing to capture Ludgate, he became separated from the main body of his followers, was taken prisoner, and soon after executed in London, April 11, 1554.

SIR THOMAS WYATT.

**Wycherley, William,** an English dramatist; born in Clive, near Shrewsbury, England, about 1640. His early years were spent in France, afterward he was educated at Oxford, and entered himself at the Temple; while in 1670 he became known as a fashionable man about town and the author of "Love in a Wood." This comedy was followed by the "Gentleman Dancing Master," the "Country Wife," and the "Plain Dealer." In 1680 he married the Countess of Drogheda, a young, rich widow, who at her death left him a lawsuit, the expenses connected with which brought him to the Fleet Prison. Here he remained for seven years, till released and pensioned by James II. Wycherley is the typical dramatist of the Restoration group, in which all the brilliancy and dissoluteness of that school are very prominent. He died in 1715.

**Wyclif, Wickliffe,** or **Wiclif** (the name is spelled in several ways), **John,** an English reformer; born in the village of Ispreswel (later Hipswell), Yorkshire, England, between 1315 and 1320, the year 1324 assigned by Lewis and accepted by several subsequent biographers being too late to tally with other facts in his life. Of his childhood and youth no account has been preserved. He probably went to Oxford when a mere lad, and he certainly had a remarkable university career; but all details are wanting till 1356, when we find him (if there is not a confusion with another John Wyclif) seneschal of Merton College. In 1361 he was master or warden of Balliol, and though in May of the same year he was appointed rector of Fillingham in Lincoln, the university continued for a long time the main seat of his activity. About four years later, Simon Islip, Archbishop of Canterbury, appointed him (if this be not again the other Wyclif) warden of the new foundation of Canterbury Hall, but after Islip's death he was expelled by the monkish members, whose action was sanctioned by papal bull in 1370 and confirmed by royal decree in 1372.

Meanwhile he had become Professor (*i. e.*, doctor) of Theology. Lechler thinks it not improbable that he was a member of the famous Parliament of 1366, and at any rate he wrote about this time a tractate or dialogue in defense of the national policy toward the Pope. In 1374 he was one of the commissioners sent to Bruges to arrange a concordat, and about the same time he received from the king himself (Edward III.) the rectory of Lutterworth in Leicestershire. With Edward's younger son, John of Gaunt, Duke of Lancaster, he was in spe-

cial favor; but this very favor was probably the proximate cause of the first hostile action of the clergy. Summoned before the Convocation in 1377, he was saved from all danger by the high-handed protection of the Duke of Lancaster and his friends, who made their way into the assembly and rendered all judicial proceeding impossible; and though in the following year a formidable process was instituted against him by direct command of Gregory XI., the papal commissioners were induced by the intercession of the Princess Joanna and the evident sympathy of the citizens to do no more than forbid him further to disseminate his obnoxious doctrines. But in the course of the following years he grew more and more estranged from the orthodox creed, and his endeavors to propagate his opinions were of wider scope than before.

In 1378 the election first of Urban VI. and then of Clement VIII. produced a schism in the Church; each Pope condemned his rival as antipope, and Wyclif declared that they were both right, and that the papacy was Antichrist. He called in question the doctrine of transubstantiation, and declared that pilgrimages and monastic vows had no authority from Scripture. His views were accepted by numerous disciples, and disseminated by preachers through the length and breadth of the land. The ecclesiastical authorities endeavored to suppress the movement by fair means and foul; but though many of its leaders were silenced, the great originator of the whole continued to the end boldly to bear witness to the truth.

The importance of his life work may be read in the religious history of Europe during the 15th and 16th centuries. In England the Lollards, as his followers were called, were driven gradually into the background, but their doctrines were taken up on the Continent by Huss, and continued potent in many ways till they were absorbed in the larger wave of the great Reformation. Wyclif was a man of powerful intellect and philosophic subtlety; uniting a fondness for scholastic speculation and argument with a rare power of appealing simply and effectively to common sense. Wit, humor, and sarcasm abound in his pages. It is not probable that the popular view of his character and position will be seriously modified, but it should be known that a less favorable opinion than the one just expressed has been pronounced by many competent critics. He had a way of minimizing his heresies when under examination, and of fortifying himself when in danger with the sword of the civil magistrate, or rather of the "lords temporal," that shows a prudent but not a heroic temper. Insisting that every priest should imitate the poverty of his Divine Master, he himself was a pluralist for the greater part of his life.

According to Shirley, his Latin works are 96 in number and his English 65. The latter, of which Arnold recognizes only 41 as genuine, are for the most part of the pamphlet type; but among the former there are 12 or 13 large treatises. A great proportion of the whole are still in MS. It is enough to mention his "Thialogus," published by Lechler (1869); "Concerning the Office of Pastor" (also ed. by Lechler, 1863); "Concerning the Divine Dominion" (MSS.); "Concerning the Civil Dominion" (MS.), and "Wyclif's Wicket, or a Treatise on the Sacrament" (1612). Thomas Arnold edited "Select English Works of John Wyclif" (3 vols. 1869–1871). Wyclif's greatest contribution, however, to English literature was his translation of the New Testament from the Vulgate, which is nearly as remarkable in point of language as the later version of Tyndale. The first edition was printed by Lewis (1731). Wyclif died in Lutterworth, Dec. 31, 1384.

**Wycombe,** a market town of Buckinghamshire, England; on the Wye; 25 miles E. S. E. of Oxford and 29 W. N. W. of London. Called variously Chipping (or Chepping) Wycombe and High Wycombe, it was the seat of a Saxon fortress, Desborough Castle, some remains of which may be seen, and has a fine cruciform parish church (1273–1522; restored 1874–1888) with a tower 96 feet high, a guildhall (1757–1859), a literary institute (1854), a free library, a hospital (1875, endowed and enlarged with the balance of the Beaconfield Memorial Fund), a grammar school (1555; new buildings, 1883), and an auctionmart (1887). Lace is made, but the staple manufacture is that of beech wood and other chairs — between one and two millions annually — with latterly whole furniture suites of a very high character. There are also some large paper-mills in the town and district. Hughenden and Chalfont are near. Wycombe was governed by a mayor in Henry III.'s time, but first incorporated by Henry VI.; the municipal boundary was extended in 1880.

**Wye,** a river of South Wales, which, rising from Montgomeryshire, near the Severn's source, and flowing generally S. E. between Radnor and Brecon, through Hereford, and between Gloucester and Monmouth, enters the Severn at Chepstow, 123 miles below its head. Rapid and rockbound as far as Hay, the Wye grows gentler as it gathers volume, but throughout is singularly beautiful, making innumerable horseshoe curves between wooded banks, and passing by Maeslough, Clifford, Gooderich, and Chepstow Castles, Hereford Cathedral, and Tintern Abbey.

**Wykeham, William of.** See WILLIAM OF WYKEHAM.

**Wyman, Robert Harris,** an American naval officer; born in Portsmouth, N. H., July 12, 1822; entered the navy in 1837; was acting master on the frigate "Brandywine" in 1843–1846; and, attached to the Gulf Squadron during the Mexican War, took part in the siege and capture of Vera Cruz and the expeditions that captured Tuspan and Tampico. He was at the naval observatory in Washington in 1848–1850 and 1853–1854. In the Civil War he commanded the "Yankee" and "Pawnee" and the Potomac flotilla in 1861; and the "Wachusett" on the Potomac and the "Santiago de Cuba" on blockading duty in 1862–1864. He became captain in 1866, commodore in 1872, and rear-admiral in 1878; was commander-in-chief of the North Atlantic Station in 1879–1882; and was selected chairman of the Lighthouse Board June 5, 1882. He died in Washington, D. C., Dec. 2, 1882.

**Wyman, Walter,** an American surgeon; born in St. Louis, Mo., Aug. 17, 1848; was graduated at Amherst College in 1870, and at the St. Louis Medical College in 1873; became assistant surgeon in the United States Marine Hospital Service in 1876; chief medical purveyor in quarantine division in 1888; supervising surgeon-general in 1891; and surgeon-general of the combined Public Health and Marine Hospital Service in 1902. Under his management was one of the finest laboratories in the world, where diseases were constantly being scientifically investigated. He was an earnest advocate for the sanitation of ports not only in the United States but in the West Indies and South America, holding that if this were enforced yellow fever would be entirely eradicated from the Western Hemisphere. He was also interested in purifying water supplies; in the study of leprosy and tuberculosis; etc. On his recommendation the government set apart a large tract of land in New Mexico for a hospital whence all consumptive patients in the United States marine hospitals could be transferred.

**Wynne, Mrs. Madelene (Yale),** an American artist and story-writer; born in Newport, N. Y., Sept. 25, 1847; the daughter of Linus Yale, inventor of the Yale lock; studied art in the Boston Art Museum, the Art Students' League, New York, and with George Fuller; was also a worker in metal. She wrote "The Little Room and Other Stories."

**Wyntoun, Andrew,** an ancient rhyming chronicler of Scotland, who lived in the early part of the 15th century. He was a canon regular of St. Andrews, as also prior of St. Serf's Inch, in Lochleven. His "Chronicle," which is in the Scottish vernacular, and is called the "Orygynale Cronykil of Scotland," begins with the creation of the world, and is brought down to the death of Robert III. in 1406. The first five books contain an outline of general history and geography; the four remaining books dealing with Scotland.

**Wyoming,** a State in the Western Division of the North American Union; bounded by Montana, South Dakota, Nebraska, Colorado, Utah, and Idaho; admitted to the Union, July 10, 1890; State capital, Cheyenne; number of counties, 13; area, 97,575 square miles; pop. (1900) 92,531; (1910) 145,965.

*Topography.*— The surface of the State is very rugged, being diversified by mountains, valleys, plains, and plateaus, the latter covered with grasses of great nutrition and furnishing admirable pasture for live stock. The main range of the Rocky Mountains enters the State from the S. terminating in the Wind River Mountains, with an altitude of from 10,000 to 14,000 feet, and snow capped the entire year. The Shoshone Mountains extend N. of the Wind River range. Running S. from the N. boundary to the center of the State are the Big Horn Mountains. Other notable ranges are the Sweetwater, Rattle Snake, Medicine Bow, and Sierra Madre. The highest peak is Fremont's Peak, in the Wind River range, 13,790 feet. Other high points are Grand Teton Peak, 13,690 feet; Mount Sheridan, 13,691 feet, and Atlantic Peak, 12,700 feet. The principal rivers, are the North Platte, entering the State from Colorado; Green river flowing S. E. into Utah; Snake or Shoshone river, rising in Yellowstone Park, flows into Idaho; the Yellowstone; Big Horn; Cheyenne; Belle Fourche; and Powder. None of these streams are navigable in a commercial sense, but they furnish water for the irrigation and development of the surrounding country, and in some instances are used for the transportation of timber. There are several important lakes, including Yellowstone Lake in Yellowstone Park, the N. W. corner of the State; Jackson's; Shoshone; Lewis; Madison; Fremont; Boulder, and Uradisa.

*Geology and Mineralogy.*— The geological formations of Wyoming cover nearly every age, and though not thoroughly explored are known to contain at least the Tertiary, Carboniferous, Cretaceous, Eozoic, Silurian, Triassic, Jurassic, Devonian, and Volcanic. The mineral productions are quite extensive, including copper, gold and silver, coal, iron, oil, soda, and building stones. The oil belt extends entirely across the State from S. W. to N. E. Natural gas is said to exist at various points adjacent to the explored oil belt. In 1900 the principal products were coal, 3,837,392 short tons, valued at $4,742,525; gold, 1,655 fine ounces, valued at $34,200; silver, 200 fine ounces, valued at

$124; coke, 14,501 short tons, valued at $43,503; petroleum, 5,450 barrels, valued at $38,150; granite, $8,700; sandstone, $27,671; limestone, $3,065; and clay products, $21,500.

*Agriculture.*— The soil of the mountains and high plateaus is a light sandy loam; darker and richer in the valleys, slightly alkaline, but, under irrigation, producing large crops. It is estimated that 10,000,000 acres of the State are suitable for agricultural purposes by irrigation. The principal farm products in 1900 were corn, 81,704 bushels, valued at $49,021; wheat, 366,414 bushels, valued at $278,475; oats, 630,272 bushels, valued at $296,228; potatoes, 388,179 bushels, valued at $263,962; and hay, 493,446 tons, valued at $3,602,156.

*Manufactures.*— In 1900 there were reported 380 manufacturing establishments, employing $2,440,958 in capital, and 2,250 persons, and having an annual output valued at $4,324,752. The chief manufactures included railroad cars and railroad supplies, lumber and timber products, saddlery and harness, tobacco, boots and shoes, millinery, brooms, flour and grist, lime and cement, and malt.

*Banking.*—On Oct. 31, 1901, there were reported 14 National banks in operation, having $885,000 in capital, $448,925 in outstanding circulation; and $453,250 in United States bonds. There were also 10 State banks, having $141,750 capital, and $46,747 surplus; and 9 private banks, with $179,868 capital, and $12,355 surplus.

*Education.*—At the end of the school year 1899–1900 the children of school age numbered 19,740; the enrollment in public schools, 14,512; and average daily attendance, 10,160. There were 524 public school buildings, public school property valued at $453,607, and 570 teachers. For higher education there were 6 public high schools, 2 private secondary schools, and the University of Wyoming, at Laramie.

*Churches.*— The strongest denominations in the State are the Roman Catholic; Methodist Episcopal; Lutheran, General Council; Protestant Episcopal; Presbyterian; Congregational; Regular Baptist; and Mormon. In 1899 there were reported 95 Evangelical Sunday-schools, with 455 officers and teachers, and 8,480 scholars.

*Postoffices and Periodicals.*— On Jan. 1, 1901, there were 317 postoffices of all grades; and 39 periodicals, of which 4 were daily, 2 semi-weekly, 32 weekly, and 1 monthly.

*Railroads.*— The total length of railroads within the State, Jan. 1, 1901, was 1,372 miles, of which, 146 miles were constructed during the previous year.

*Finances.*— The total debt on Feb. 1, 1901, was $320,000, all bonded; divided as follows: Capital Building bonds, $150,000; Insane Asylum bonds, $30,000; Public Building bonds, $90,000; and University Building bonds, $50,000, now being paid off at the rate of $20,000 per annum. The assessed valuation of all taxable property in 1901 was $39,581,216, and the State tax rate, $6 per $1,000.

*State Government.*— The State officers are elected for a term of four years. The governor's salary is $2,500 per annum; other officers, $2,000. Legislative sessions are held biennially in odd years, beginning on the second Tuesday in January, and are limited in length to 40 days each. The Legislature has 23 members in the Senate and 50 in the House, each of whom receives $5 per day and mileage. There is one Representative in Congress. The State government, except the governor of 1892–1893, has always been Republican.

*History.*— The greater part of the area of Wyoming was included in that of the Louisiana Purchase of 1802, though the W. section formed part of the Oregon settlement. It was organized as a Territory July 25, 1868, from what was then the S. W. portion of Dakota, the N. E. part of Utah, and from the E. part of Idaho, to which the name of Wyoming was given. This Territory was admitted to the Union as a State July 10, 1890. The oldest white settlement within its confines was Fort Laramie, on Platte river, which was made a fur trading post in 1834, rebuilt by the American Fur Company in 1836, sold by them to the United States and garrisoned as a fort in 1849. It was long an important base of operations against the Indians, though it is now abandoned. Settlement took place very slowly till recently, the Indians occupying the more fertile districts. As the latter were removed, settlement became more rapid. The N. W. corner of the State, remarkable for its natural beauties and wonders, has been set aside as the Yellowstone National Park.

**Wyoming, University of,** a coeducational non-sectarian institution in Laramie, Wyo.; chartered in 1886; opened in 1887; has productive funds exceeding $35,000; grounds and buildings valued at over $375,000; scientific apparatus, etc., $130,000; volumes in the library, about 30,000; average number of faculty, 40; average student attendance, 275.

**Wyoming Valley,** a valley in Luzerne co., Pa., famous as the scene of a massacre following a battle of Tory and Indian invaders, on one side, and the American settlers on the other, July 3, 1778. The American force was weak, nearly all the fighting men being away in the Continental army, and more than half of it was killed. The survivors took refuge in Forty Fort, where most of the families of the valley had gathered. The Tories, under Colonel Butler, offered unexpectedly easy terms of surrender,

WYOMING
SCALE OF MILES
0 5 10 20 30 40
Indian Res.
Forest Res.
Military Res.
State Capital
County Seats
A
B
C
D
111
110
109
108
Longitude 108
1
2
3
4
5
45
44
43
42
41
M O N T
I D A H O
U T A H
C O L
YELLOWSTONE NATIONAL PARK
Gardiner
Jardine
Yellowstone Park
Tower Fall
Norris Geyser Basin
Lower Geyser Basin
Upper Geyser Basin
Yellowstone
Elephant Back
Catnedral Pk.
Mt. Chittenden
Yellowstone Lake
Grand Canyon
Madison R.
Shoshone L.
Lewis L.
Iris Falls
Colonnade Falls
Red Mts.
Two Ocean Plateau
Big Game Ridge
CONTINENTAL DIVIDE
Cooke
Roscoe
Tony
Linley
Bridger
Bearcreek
Golden
Red Lodge
Riverview
Chance
Bowler
Scribner
Ewing
Sage Cr.
Clark Fk.
Clark
Crandall
Painter
Black Mt.
Dead Indian Pk.
Frannie
Mantua
Garland
Powell
Ralston
Penrose
Cowley
Lovell
Byron
Ionia
Kane
Chrystal
Clover
Corbett
Cody
Marquette
Wapiti
North Fk.
Shoshone
Wapiti Ridge
Ishawooa
Fortress Mt.
Table Mt.
Ishawooa Cone
Valley
Fourbear
Meeteetse
Crater Mt.
Sunshine
Gooseberry Cr.
Grey Bull
SHOSHONE RESERVE
SHOSHONE MTS.
B I G  H O R N
P A R K
Greybull
Germania
Burlington
Fenton
Wiley
Otto
Basin
St. Joe
Shell
Jordan
Allwood
Welling
Cottonwood Cr.
Worland
Colter
Neiber
Ilo
Grass Cr.
Meeyero Cr.
Kirwin
Winchester
Kirby
Crebo
Crosby
Embar
Rothwell
Anchor
Owl Cr.
Thermopolis
Phlox Mt.
Kirby Cr.
Holt
Birdseye
Union
Dubois
Brooks
Circle
Wind River
WIND RIVER OR SHOSHONE INDIAN RES.
Dinwoody L.
Bull L.
Muddy Cr.
Shoshoni
W. Ocla
Poison
Muskrat
Riverton
St. Stephens
Arapahoe R.
Ft. Washakie
Wind River
Lt. Shoshone R.
Popo Agie R.
F R E M O N T
Milford
Lander
Dallas
Bruce
Hailey
Beaver Cr.
Myersville
Wells
Fremont Pk.
Fremont L.
Newfork Butte
Mt. Bonneville
Mt. Hooker
Mt. Chauvenet
Mt. Geikie
Boulder L.
Fayette
Boulder
Wind River Pk.
Temple Pk.
Mystrom Pk.
Atlantic Pk.
Olson
Newfork
Fremont Butte
East Fk.
Leckie
Atlantic City
South Pass City
Lewiston
Antelope Hills
Pacific
Continental Pk.
South Pass
Big Sandy Cr.
Lit. Sandy Cr.
Morton Cr.
Bear Cr.
Alkali Flats
Lost Cr.
Essex Mt.
Steamboat Mt.
N. Pilot
Alkali Flat
Dry L.
Black Rock Butte
Red Desert Basin
Great Divide
Bad Land Hills
Leucite Hills
Orenda Butte
Killpecker Cr.
Table Mts.
Thayer
Point of Rocks
Wamsutter
Latham
Creston
Joshua
Frewen
Hillside
Tipton
Table Rock
Red Desert
Robinson
Monell
Bittercreek
Patrick
Bitter Cr.
Salt Wells
Baxter
Rock Springs
Haliville
Black Buttes
Black Butte
Sweetwater
Aspen
Wilkins
Green River
Peru
Bryan
Marston
Granger
Azusa
Church Buttes
S W E E T W A T E R
Aspen Mts.
Lit. Bitter Cr.
South Bitter Cr.
Black Fk.
Green R.
Maxon
Alkali Cr.
Burntfork
Linwood
Mt. Corson
Jackson L.
Moran
Buffalo Fork
Elk
Elkhorn Cr.
Pacific Cr.
Teton Range
Gros Ventre R.
Zenith
Wilson
Jackson
Cheney
Gros Ventre Range
Hobacks R.
Bondurant
Kendall
Snake River Range
Grand Canyon
Mt. Baird
Salt Range
John Day R.
YELLOWSTONE FOREST
Virginia Pk.
Merna
Horse Cr.
Cora
Burns
Pinedale
Daniel
Halfway
Ball
Wyoming Pk.
Mason
Stanley
Bigpiney
Mt. Darby
Jensen
Midway
La Barge Cr.
Viola
Labarge
Fontenelle
Palisade
Slate Cr.
Green
Freedom
Thayne
Bedford
Grover
Afton
Smoot
Mt. Wagner
Fairview
Auburn
Williamsburg
Geneva
Raymond
Alton
Border
Pegram
Cokeville
Hamsfork
Pixley
Beckwith
Sage
Fossil
Frontier
Kemmerer
Diamondville
Nugget
Moyer Jc.
Glencoe Jc.
Glencoe
Opal
Waterfall
Quarry
Oakley P.O.
Squr or Verne
Nutria
Moxa
Hams Fk.
Cumberland
Hampton
Elkhurst
Carter
Antelope
Bridger
Bear River Divide
Almy
Evanston
Almy Jc.
Wyuta
Springvalley
Millis
Knight
Aspen
Altamont
Hilliard
Leroy
Bridger Butte
Millburne
Piedmont
Lyman
Bridger
Ft. Bridger Mil. Res.
Mountainview
Robertson
Lonetree
Bear R.
Rice
Sarilda
Lodi
Ora
Vernon
Marysville
Ashton
Fremont
Squirrel
Chester
Farnum
St. Anthony
Wilford
Teton
Teton R.
Badger
Haden
Leigh
Alta
Cache
Driggs
Heise
Bates
Chapin
Victor
Snake R.
Lyon
Irwin
Rosa
Caribou Ra.
Herman
John Grays L.
Gray
Glen
Wayan
Henry
Soda Springs
Nounan
Georgetown
Lindsayville
Bern
Bennington
Sharon
Liberty
Montpelier
Ovid
Wardboro
Paris
Dingle
North L.
Bloomington
St. Charles
Turnpike
Fish-haven
Bear Lake
Garden City
Mt. Gog
Mt. Magog
Laketown
Randolph
Woodruff
Echo
UNION PAC.

Kirby
Little Horn
Wyola
Aberdeen
Pearl
Graham
Moorhead
Fivemile
Alzada
Moreau R.
Willow Cr.
Parkman
Decker
Garneyville
Dietz
Ft. Mackenzie
Arno
Monarch
Wolf Mtn.
Beckton
Big Horn
Carrol
Story
Banner
Ulm
Regis
Arvada
Cadiz
Verona
Clearmont
Sheridan
Morse
Ridge
Mona
Alva
Eothen
Hulett
Aladdin
Farrall
Forest
Beulah
Carlile
Bertha
Lariat
Echeta
Felix
Oriva
Sparta
Gillette
Minturn
Rozet
Wessex
Moorcroft
Kara
Sheldon
Buckhorn
Linden
Sundance
Manhattan
Spearfish
Whitewood
Deadwood
Lead
Sturgis
Hamilton
Kearney
Buffalo
Barber
Thornton
Upton
Horton
Boyd
Jerome
Hazelton
Trabing
Greub
Rome
Osage
Cambria
Pedro
Newcastle
Spencer
Custer
Elk Mountain
Clifton
Dakoming
Hampshire
Mayoworth
Bigtrails
Kaycee
Sussex
Barnum
Middle Fk.
Middle Butte
Pumpkin Butte
Houck
Ross
Antelope Cr.
Dale
Hot Springs
Edgemont
Hatcreek
Kirtley
Lusk
Node Ranch
Harrison
Shawnee
Orin
Fisher
Irvine
Beaver
Boxelder
Douglas
Casper
Garfield Pk.
Poison Spider
Oilcity
Rattlesnake Ra.
Haystack Ra.
Clear Creek Ra.
Alcova
Freeland
Pathfinder
Hammond
Laboute
Willow
Van Tassel
Rawhide Butte
Raw Hide Buttes
Natrona
Powder River
Cadoma
Bucknum
Glenrock
Converse
Hatcreek
Kirtley
Lusk
Node Ranch
Harrison
Shawnee
Orin
Fisher
Douglas
Irvine
Beaver
Boxelder
Willow
Van Tassel
Rawhide Butte
Raw Hide Buttes
Alcova
Freeland
Pathfinder
Hammond
Laboute
Clarence
Foxton
Glendo
Esterbrook
Springhill
Macfarlane
Frederick
Sunrise
Fairbank
Guernsey
Whalen
Ft. Laramie Sta.
Patrick
Wyncote
Vaughn Sta. or Athol P.O.
Torrington
Pyramid Pk.
Little Medicine
Heaths Pk.
Laramie Pk.
Eagle Pk.
Medicine Bow Mts.
Leo
Shirley
Shirley Mts.
Bald Mt.
Difficulty
Marshall
Toltec
Fishcreek
Buckhorn
Ft. Laramie
Wyman
Reed Pk.
Uva
Grayrocks
Garrett
Owen
Wheatland
Pratt
Morrill
Bordeaux
Hanna
Carbon
Edison
Dana
Walcott
Coalton
Elk Mountain
Rock River
Harper
Aurora
Wilcox
Allen
Ridge
Mc Gill
Rockcreek
Dover
Grant
Moore
Chugwater
Trelona
Hagie
Gering
Lagrange
Meriden
Phillips
Goldsmith
Underwood
Iron Mountain
Meadow
Horse Creek
Little Bear
Horse Creek Sta.
Albin
Salem
South Bend
Harrisburg
Sibylee
Coopers Lake
Bosler
Wayside
Diamond
Rockdale
Milo
Lookout
Arlington
Coal Mts.
Nickell
Saratoga
Wood Mts.
Morgan
Wyoming
Howell
Leslie
Mandel
Bona
Laramie
Islay
Centennial
Filmore
Bennett
Canyon
Riverside
French
Encampment
Dillon
Copperton
Rambler
Downington
Cow Creek
Holmes
Buckeye
Albany
Keystone
Forelle
Satanka
Redbuttes
Hermosa Jc.
Tie Siding
or Hermosa Sta.
Woods
Jelm
Colores
Hecla
Buford
Ft. Russell
Silver Crown
Hillsdale
Durham
Archer
Egbert
Altvan
Campstool
Arcola
Tracy
Pine Bluff
Kimball
Hereford
Mohler P.O.
or Athol Sta.
Virginia Dale
Pearl
Hemingway
Wolton
Natrona
Converse
Niobrara
Laramie
Albany
Carbon
Sheridan
Crook
Weston
Johnson
Campbell
Big Horn
Washakie
Hot Springs
Fremont
Natrona
Converse
Niobrara
Weston
Crook
Sheridan
Johnson
Campbell
Laramie
Albany
Carbon

Hammond's 8.x 11 Map of Wyoming
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and the settlers went back to their homes, while the invaders were supposed to be leaving the valley. Against the commands of their white leaders the Indians remained, and, on the night of July 4, began massacreing the inhabitants and burning the houses. All who could escape made their way into the Wilkesbarre Mountains and the swampy land beyond, where so many women and children died that it was afterward called "The Shades of Death." When peace was established and the Indians came under control, the surviving settlers returned. They were confirmed in the possession of the valley about 1787.

**Wyss, Johann Rudolf** (vis), a Swiss author; born in Bern, Switzerland, March 13, 1781; was Professor of Philosophy and chief librarian of Bern. His writings are: "Lectures on the Supreme Good" (2 vols. 1811); "Idylls, Folk-Songs, Legends, and Narratives from Switzerland" (3 vols. 1815–1822); and "Travels in the Bernese Alps" (1808). He edited a series called "Alpenrose" (20 vols. 1811–1830). His "Swiss Family Robinson" has been translated into many languages. He died in Bern, March 31, 1830.

**Wythe, George,** a signer of the Declaration of Independence; born in Elizabeth City, Va., in 1726; was educated at William and Mary College; studied law and became eminent in that profession; was chosen to the Virginia House of Burgesses in which he became a leader. He was author of a paper remonstrating against the Stamp Act, which was adopted after being modified. In 1775 he was sent to the Continental Congress and affixed his name to the Declaration of Independence on July 4, 1776, as a representative of Virginia. He was made speaker of the Virginia House of Delegates in 1777, and the same year became a judge in the Court of Chancery of Virginia. He was Professor of Law at William and Mary College in 1779–1789, and a delegate to the Constitutional Convention of 1786. He was the author of "Decisions in Virginia by the High Court of Chancery, with Remarks upon Decrees by the Court of Appeals" (1795). He died in Richmond, Va., June 8, 1806.

**Wyttenbach, Daniel** (vit'ten-ba*h*), a Dutch scholar; born in Bern, Aug. 7, 1746; studied at Marburg, Göttingen, and Leyden; became Professor of Greek at the Remonstrant Gymnasium at Amsterdam in 1771, of Philosophy at the Athenæum in 1779, and succeeded in 1799 to Ruhnken's chair of rhetoric at the university. His greatest work is the edition of Plutarch's "Morals," with rich annotations and an admirable "Greek Index to Plutarch's Works" (Oxf. 8 vols. 1795–1830). He retired in 1816, and died after some years of blindness in Ösgeest, Jan. 17, 1820. His wife, JOHANNA GALLIEN, a niece of Hanau, whom he married at 72, was a remarkably accomplished woman. She lived after her husband's death at Paris, was given the degree of doctor in philosophy by Marburg, in 1827, and died in Leyden in 1830. Among her writings were: "Theagenes" (Paris, 1815); "Leontes' Banquet" (Ulm, 1812), and the romance "Alexis" (Paris 1823).

WYVERN.

**Wyvern** (from Latin *vipera*), a fictitious monster allied to the dragon and the griffin, and frequently occurring in heraldry. It resembles a dragon, but has only two legs and feet, which are like those of the eagle.

# X

**X,** the 24th letter of the English alphabet. It is superfluous, as it represents no sound which cannot be expressed by other letters. Thus, when used at the beginning of a word it has precisely the sound of z; when occurring in the middle of a word it usually has the sound of ks, as in axis, taxes, foxes, etc.; it also has the same sound in some cases when terminating a word, as lax, wax, etc.; when it terminates a syllable, and more especially an initial syllable, if the syllable following it is open or accented, it frequently has the sound of gz, as in luxury, exhaust, exalt, exotic, etc. As an initial it occurs only in words of Greek origin, or formed from Greek words, most of these formations being of a scientific or technical nature.

X as a symbol is used in numeration: For 10, in this case being composed of two Vs (5) placed one above the other, the lower one being inverted. When placed horizontally it stands for 1,000 and with a dash over it, it represents 10,000.

In ordinary writing X is frequently used as an abbreviation for Christ. In this case the symbol is not the same letter as the English X, but represents the Greek X (Ch), as in Xn = Christian, Xmas = Christmas.

**X,** as used on beer casks is said to have originally been employed to indicate beer which had paid 10 shillings duty.

**Xanthamide,** $C_3H_7ONS = COS(C_2H_5)NH_2$, a crystalline substance produced by passing ammoniacal gas into an alcoholic solution of xanthic ether. Insoluble in water, but soluble in alcohol and ether.

**Xanthate of Potassium,** $C_3H_5OKS_2$; obtained by adding carbonic disulphide to a saturated alcoholic solution of potassic hydrate. It separates in slender, colorless prisms, soluble in water and alcohol, insoluble in ether. Gradually destroyed by exposure to the air.

**Xanthelasma,** the name given by Dr. Erasmus Wilson to a cutaneous disease, consisting of isolated or confluent tubercles varying from the size of a pin's head to that of a pea. Its most frequent seat is around the eyelids.

**Xanthian Marbles,** a large collection of marbles of various ages (from 545 B. C. onward) which were discovered near Xanthus, in 1838.

**Xanthic Acid,** $C_3H_6OS_2$; a colorless oily liquid, prepared by decomposing xanthate of potassium with dilute sulphuric or hydrochloric acid. It is heavier than water, has a powerful and peculiar odor, and decomposes at 24° in alcohol and carbonic disulphide. Its salts are yellow.

**Xanthic Ether,** $(C_2H_5)_2.COS_2$; ethylic disulpho-carbonate; a pale yellowish oil, obtained by the action of ethyl chloride on xanthate of potassium. It is insoluble in water, soluble in all proportions in alcohol and ether, and boils at 210°.

**Xanthine,** $C_5H_4N_4O_2$, a natural base present in nearly every part of the animal organism, and in minute quantities in urine. It was first described under the name of xanthic oxide by Marcet, who discovered it in urinary calculi. It may be prepared with great facility from guanine by treating that substance with nitric acid. This action gives rise to xanthine and another substance, nitroxanthine, which by the action of reducing agents is reduced to xanthine also. Xanthine is a white, amorphous powder, hardly soluble in water, but forming with acids crystalline compounds. It dissolves in nitric acid without evolution of gases, and also dissolves readily in ammonia and potash.

**Xanthinine,** $C_4H_3N_3O_2$; a yellow powder, prepared by heating ammonium thionurate to 200°. It is slightly soluble in boiling water, the solution having a light blue fluorescence, but dissolves readily in nitric and hydrochloric acids.

**Xanthiosite,** a name given by Adam to an amorphous nickel ore, analyzed by Bergemann; hardness, 4.0; sp. gr., 4.982; color, sulphur-yellow; composition: Arsenic acid, 50.05; nickel, 49.5 = 100, whence the formula $3NiOAsO_5$. Found at Johanngeorgenstadt, Saxony.

**Xanthitane,** a pulverulent mineral found associated with zircon at Green River, Henderson co., N. C.; hardness, 3.5; sp. gr.,

2.7–3.0. Analysis showed it to consist of titanic acid, with traces of zirconia, and 12.5 per cent. of water. Probably a result of the decomposition of sphene.

**Xanthite,** a variety of idocrase, found in small rounded grains or imperfect crystals of a yellow or grayish color, at Amity, in New York. Its principal constituents are silicate of alumina and silicate of lime.

**Xanthium** (so named because an infusion of species of the genus was used by the Greeks to dye their hair), burweed; a genus of *Senecionideæ*, sub-tribe *Ambrosieæ*; monœcious composites; the barren flowers having an involucre of few scales, with many capitate flowers on a common receptacle, the fertile ones with a single, prickly, two-beaked involucre entirely closing the flowers, and with apertures for the protrusion of the two stigmas, fruit included in the enlarged and hardened involucre. *X. strumarium* and *X. spinosum* are casuals in Great Britain; the former is a weed common in waste places, on river banks, and near villages in India, and troublesome to cultivators. It is said to yield an oil, used in medicine and as an illuminant. The whole plant is considered to be diaphoretic and sedative. It is administered in decoction in malarious fever. The root is a bitter tonic, useful in cancer and in strumous diseases. The leaves are poisonous to cattle.

**Xantho,** a genus of *Canceridæ*, with many species. Carapace very wide, not particularly convex; front generally advanced, lamellar, divided by a narrow fissure in two lobes, with their borders notched in the middle; anterior feet generally unequal in the male; abdomen with seven segments in the female, and, as a rule, five in the male.

**Xanthobetic Acid,** an acid extracted from the root of *Beta vulgaris* by cold alcohol. It is a reddish-yellow mass, very hygroscopic, has a sour taste, is soluble in water and alcohol, slightly soluble in ether.

**Xanthochroi,** fair whites; the name applied by Huxley to a population, in early times extending from Western and Central Asia into Eastern and Central Europe, and distinguished by yellow or red hair, blue eyes and fair complexion. The farthermost limit of the Xanthochroi N. is Iceland and the British Isles; S. W. they are traceable at intervals throughout the Berber country, and end in the Canary Islands.

**Xanthochymus,** a genus of *Garcinieæ;* trees with thick, opposite leaves; five sepals; five petals; five bundles of stamens, alternating with five large glands; a five-celled ovary; a fruit with five or fewer cells; known species three, from tropical Asia. *X. pictorius* occurs in the mountains of Southern India. It has a bright yellow, pleasant-tasted fruit of about the size of an apricot. The juice of the tree furnishes an inferior kind of gamboge.

**Xanthocone,** or **Xanthoconite,** a very rare mineral occurring only in small crystals and reniform groups associated with stephanite, proustite, etc.; crystallization, rhombohedral; hardness, 2.0; sp. gr., 5.0–5.2; color, dull red, clove-brown, orange-yellow; brittle; composition: Sulphur, 21.1; arsenic, 14.9; silver, 64.0 = 100, whence the formula $(3AgS + AS_2S_5) + 2(3AgS + As_2S_3)$.

**Xanthogen,** or **Xanthogene,** Hope's name for a light-yellow non-crystalline substance found in flowers, and supposed to be widely distributed throughout the vegetable kingdom. It is soluble in water, alcohol, and ether, and is turned yellow on the addition of an alkali. Clamor-Marquart gave to the same substance the name resin of flowers.

**Xanthophenic Acid,** a yellow coloring matter of unknown composition, obtained by heating phenol or cresol with arsenic acid. It dissolves in water with a golden-yellow color, and in alkalies with a red color, and dyes silk and wool without the aid of mordants.

**Xanthoproteic Acid,** $C_{34}H_{26}N_4O_{12}$ (?); xanthoprotein; a dibasic acid, obtained by the action of nitric acid on albumin, fibrin, casein, and horny matters. It is an orange-yellow amorphous powder, tasteless, inodorous, insoluble in water and alcohol, but forming deep-red solutions with aqueous alkalies.

**Xanthorhamnin,** $C_{23}H_{28}O_{14}$ (?); a yellow coloring matter, obtained by boiling coarsely-ground Persian berries with alcohol, filtering, and allowing the filtrate to crystallize. It forms tufts of pale-yellow shining crystals, soluble in water and alcohol, insoluble in ether.

**Xanthorrhiza,** a genus of *Ranunculaceæ*, tribe Actæeæ. Sepals five, deciduous; petals five, much smaller than the sepals; ovaries 5 to 15, each with two or three ovules; follicles usually by abortion one-seeded. *Xanthorrhiza apiifolia*, an undershrub, is one of the plants called in America yellow-root. Its root, pith, and the inner layers of wood are bright yellow, and were used by the American Indians as a yellow dye. It yields both a gum and a resin, both of them intensely bitter, as are the wood and bark. It is prescribed as a tonic.

**Xanthorrhœa,** a genus of *Liliaceæ*, tribe Aphyllantheæ; plants botanically of the lily type, but with longer or shorter arborescent trunks, formed by the bases of

leaves glued together with the resin which is exuded from the plant; wiry grass-like pendulous leaves, in a clump at the top of the stem, so as to partly resemble a palm tree. Flowers in a close, scaly spike; the perianth six-cleft, the stamens six, exserted; the fruit a woody, three-celled capsule with a few black seeds. They constitute the grass trees of Australia, which, from their often being blackened outside by bush fires, are popularly called also black boys. They occur in Australia and Tasmania. Their young leaves are eaten, *X. humilis*, the dwarf grass tree, being the species most commonly employed. *X. arborea* exudes a fragrant resin, smelling like benzoin, and called Botany Bay gum. *X. hastilis*, according to De Candolle, though an endogen, has an approach to medullary rays.

**Xanthos,** in classical legend, Achilles' horse. It is related in the "Iliad" that being chided by his master for leaving Patroclos on the field of battle, the horse turned his head reproachfully, and told Achilles that he also would soon be numbered with the dead, not from any fault of his horse, but by the decree of inexorable destiny.

**Xanthos of Lydia,** a Greek historian; living about the 6th century B. C., contemporary with Herodotus. He wrote a work called "Lydiaca," being a history of Lydia from heroic times down, and giving also a geographical description of the country; fragments of it have been preserved.

**Xanthoura,** a genus of *Corvidæ*, founded by Bonaparte, with three species, ranging from equatorial America N. to Mexico and Texas. Head without crest, bill very stout, rather higher than broad, culmen curved from base; nostrils rather small, oval, concealed by nasal tuft; tail longer than wings, graduated; wings concave, rounded; legs very stout.

**Xanthous,** a term applied by Prichard to his yellow-haired variety of the human race, characterized by hair of a reddish, yellowish, or flaxen color, the iris of the eye of a light hue, generally blue or gray. Typical example, the tribes or individuals of pure Germanic descent.

**Xanthoxylaceæ,** in botany, the xanthoxyls; an order of hypogynous exogens, alliance Rutales; aromatic or pungent trees or shrubs; leaves abruptly or unequally pinnate, more rarely simple, with pellucid dots; stipules wanting; flowers axillary or terminal, often unisexual; sepals four or five, rarely three; petals generally the same number as the sepals, rarely wanting; stamens equal in number to or twice as many as the petals. Fruit berried or membranous, with two to five cells, sometimes of several drupes, or two-valved capsules; seeds one or two, pedulous. Natives of tropical America, India, China, Africa, etc. Known genera 20, species 110.

**Xanthoxylene,** $C_{10}H_{16}$; the volatile oil of *Xanthoxylon piperitum* (Japan pepper), first extracted by Stenhouse. It is colorless, possesses an aromatic odor, and boils at 162°.

**Xanthoxylin,** the camphor obtained by distilling the bruised seeds of *Xanthoxylon piperitum* with water. It forms monoclinic crystals, with a milky luster; insoluble in water, soluble in alcohol and ether, melts at 80°, and distills without decomposition.

**Xanthoxylon,** the typical genus of *Xanthoxylaceæ;* trees, erect or climbing shrubs, often prickly; leaves compound, pinnate, trifoliate, with the leaflets reduced to one, usually with pellucid dots; flowers small, unisexual, in axillary or terminal panicles; sepals, five, four, or three; petals and stamens as many; carpels, one to five; fruit splitting in two, with one or two shining black seeds. A large genus, found both in the Eastern and Western Hemispheres, especially in their warmer parts. They are so aromatic and pungent that in the countries where they exist they are popularly called peppers, specially *X. piperitum*, called Japan pepper. *X. rhetsa*, an Indian species, has small yellow flowers and small round berries, which, when unripe, taste like the skin of a fresh orange. Its fruit, and the seeds and bark of *X. alatum*, which grows near the base of the Himalayas, and those of *X. budrunga*, also Indian, are given as aromatic tonics in fever, diarrhœa, dysentery, and cholera. The small branches are employed to make walking sticks, and the twigs as tooth brushes. The seeds of *X. budrunga* are as fragrant as lemon peel; *X. clava* and *X. fraxineum* applied externally to the gums or taken internally, are powerful sudorifics and diaphoretics used in toothache, paralysis of the muscles of the mouth, and rheumatism. The root of *X. nitidum* is sudorific, emmenagogue, etc.; *X. caribæum* is a febrifuge; *X. piperitum* and *X. avicennæ* are regarded in China and Japan as antidotes to poison. The powdered bark of *X. hiemale* is given in Brazil in earache; and the capsules and seeds of *X. hastile* are employed in Northern India to intoxicate fish. The wood of *X. hiemale* is very hard and suitable for building.

**Xanthus,** an ancient city of Asia Minor, in Lycia; on the Xanthus river; about 8 miles above its mouth. Its ruins were discovered in 1838 by Sir C. Fellows; and have yielded a large collection of marbles, now in the British Museum. The river rises in Mount Taurus, and falls into the Mediterranean a little to the W. of Patara.

**Xantippe,** wife of Socrates, and the typical female termagant or scold. Most of the stories about her are probably false;

for in ancient Athens gossip was cultivated to the perfection of a fine art, and the point and not the truth of the story was the chief consideration. Xantippe had probably some little acerbities of temper, and these must have been heightened by the peculiarities of her spouse, especially his indifference to the commonplace duty laid on the head of the house to make both ends meet. Socrates received her reproaches with such good-humored indifference that we cannot wonder she sometimes resorted to other weapons beside her tongue; as on the occasion when she is said to have finished up a tirade by sousing the philosopher, though his remark, as he moved dripping from the scene, that when Xantippe thundered she watered, must have convinced her that here, too, she was powerless. Some authors have given Socrates a second wife, named Myrto, but the story is undoubtedly false. In our own day, Zeller has given Xantippe an elaborate whitewashing (Vorträge und Abhandlungen," 2d ed., 1875); but the opinion of mankind will, we are afraid, still be that of the Old English writer who calls her "a passing shrewde, curste, and wayward woman, wife to the pacient and wise philosopher Socrates."

**Xantippus,** a Lacedæmonian general; went to the support of the Carthaginians in 255 B. C.; and defeated the Romans under Regulus at Tunes (now Tunis). Notwithstanding his services, the Carthaginians ordered the captain of his ship to throw him into the sea.

**Xariffa.** See TOWNSEND, MARY ASHLEY.

**Xavier, Francisco,** a Spanish missionary and saint of the Roman Catholic Church, usually styled the Apostle of the Indies; born of a noble family, whose family seat of Xavier lay to the N. W. of Pampeluna, April 7, 1506. At the College of Sainte Barbe, in Paris, he attained while still young some importance as a lecturer on philosophy; but a friendship which he formed with his fellow countryman Loyola, turned his attention in a new direction, and he became one of the first members of the Society of Jesus. In the early part of 1540, before the society had received papal approbation, he was chosen for the mission to India, and received the title of apostolic nuncio from Paul III. The rest of his life was consecrated with high-souled devotion to the work of an evangelist. From Goa, his headquarters, where he arrived in May, 1542, he extended his labors S. to Ceylon, Malacca, and Celebes. The last two years of his life were spent in Japan, where he met with remarkable success, and he was on his way to China when he fell ill with fever, and was abandoned to his fate on the island of Sancian by the shipmen with whom he sailed. He expired Dec. 2, 1552. His body was conveyed to Goa, where it remains in the Church of the Bom Jesus. Once in a century it is shown to the people on the saint's day, Dec. 3. The last occasion was in 1878. Xavier was canonized in 1619, and in 1747 Benedict XIV declared him the Protector of India.

**Xavier, Jerome,** a Spanish Jesuit missionary and writer; born in Navarre; wrote both in Latin and in Persian. Among his chief works are: "A Treatise on the Mysteries of Christianity" (1600); a "Life of the Apostles"; a "History of Jesus Christ"; and a "Directory of Kings for the Government of their Subjects." He died in Goa in 1617.

**Xebec,** a small three-masted vessel with lateen sails, used for coasting voyages in the Mediterranean and on the ocean coasts of Spain and Portugal. It differs from the felucca in having square sails as well as lateen sails, the felucca having only lateen sails.

**Xema,** a genus of *Larinæ*, with one species, *X. sabini*, Sabine's gull, from the N. temperate zone. Bill rather shorter than head, moderately stout, upper mandible decurved from beyond the nostrils to the tip, gonys angulated and advancing upward; nostrils basal, lateral, linear; legs moderately long, lower part of tibiæ bare for some distance; tarsi tolerably strong; three toes in front entirely palmated; hind toe small, elevated; wings long; tail distinctly forked.

**Xenelasia,** an institution at Sparta, by which strangers were prohibited from residing there without permission, and under which the magistrates were empowered to expel strangers if they saw fit to do so.

**Xenia,** a city and county-seat of Greene co., O.; on Shawnee creek, and on the Pittsburg, Cincinnati, Chicago, and St. Louis, and the Cincinnati, Hamilton, and Dayton railroads; 55 miles S. W. of Columbus. Here are a United Presbyterian Theological Seminary, Wilberforce University for Colored Students (A. M. E.), State Soldiers' and Sailors' Orphans' Home, court house, churches, public libraries, National banks, and daily, weekly, and monthly periodicals. The city has celebrated twin and cordage plants, pump, paper, carriage, and shoe factories, marble and granite works, saw and planing mills, etc., and an assessed property valuation of nearly $4,000,000. Pop. (1890) 7,301; (1900) 8,696.

**Xenocles** (zen'ō-klēz), a Greek tragic poet; born in Athens, in the 4th century B. C., in the time of Philip of Macedon. He obtained a prize for four plays, "Œdipus,"

"Lycaon," the "Bacchantes," and "Athamas."

**Xenocrates** (zē-nok'ra-tēz), a Greek writer and philosopher; born in Chalcedon, in 396 B. C.; removed in early youth to Athens, where he joined Plato. He was for some years scholarch, or rector, of the Academy. His writings were numerous, chiefly on metaphysics and ethics, laying special stress on the latter, and working on Platonic lines. He is said to have first divided philosophy into physics, didactics, and ethics. He died in Athens, in 314 B. C.

**Xenodermichthys,** a genus placed in the family *Alepocephalidæ*, allied to *Alepocephalus*, the only species known before the voyage of the "Challenger." It is a deep-sea fish, found at about 345 fathoms, and having fine nodules, instead of scales.

**Xenogenesis,** a term introduced by M. Milne Edwards to designate that form of biogenesis in which the living parent was supposed to give rise to offspring which passed through a totally different series of states from those exhibited by the parent and did not return into the cycle of the parent. Professor Huxley remarks that the proper term for this would be heterogenesis, but that unfortunately this term has been employed in a different sense; and after showing that there are analogies both for and against xenogenesis, decides against its known existence. The nearest approach to it is not, as was once believed, in tapeworms, the history of whose transformations has been traced, but in tumors and corns on the animal body or galls on the vegetable leaves or other organs.

**Xenon,** the name of a new element discovered by Professor Ramsay and Dr. Morris Travers when making the experiments with liquid air which resulted in the finding of neon and crypton. Its spectrum resembles that of argon, while furnishing different lines.

**Xenopeltis,** a genus of *Tortricidæ*, often raised to the rank of a family (*Xenopeltidæ*). Head depressed; upper jaw produced beyond lower; teeth setaceous; no spurs in vent. There is but one species, *X. unicolor*, a curious nocturnal carnivorous snake, ranging from Penang to Cambodia, and through the Malay Islands to Celebes.

**Xenophanes** (ze-nof'a-nēz), a Greek writer and philosopher; born in Colophon about the third or fourth decade of the 6th century B. C. Exiled from his Ionian home, he established himself at Elea in Southern Italy. He is the reputed founder of the Eleatic philosophy, and his teachings found expression in both elegiac and epic poems, the most important being "On Nature" and "Satires." He died at the age of 92, in Elea.

**Xenophon,** a Greek historian, and philosopher; born about 430 B. C. At an early age he became a pupil of Socrates, and is said to have been saved from death by that philosopher at the battle of Delium. About the age of 40 he joined the expedition of the younger Cyrus against his elder brother, Artaxerxes Mnemon, King of Persia. After the battle of Cunaxa, and the treacherous massacre of the Greek generals. Xenophon played an important part in the adventurous retreat known in history as the "Retreat of the Ten Thousand"; and it was his courage and conduct that contributed mainly to its success. He alterward settled at Scillus, a small town near Olympia, in Elis, under Spartan protection, where he lived upward of 20 years, occupying himself with hunting, agriculture, and writing. At last he was driven from his retreat at Scillus by the Eleans, and took refuge in Corinth. His works are numerous, and, to judge by their titles and number, all extant. His principal works are the "Anabasis," or narrative of Cyrus's expedition and the "Retreat of the Ten Thousand"; a "History of Greece," in continuation of Thucydides; the "Cyropædia," or education of Cyrus the Elder, a historical romance; "Reminiscences (Memorabilia) of Socrates"; the "Symposium," a sequel to the Memorabilia; the "Economics." He wrote also a manual of cavalry instruction, a treatise on horsemanship, etc. He died after 357.

XENOPHON.

**Xenophon of Ephesus,** called XENOPHON THE YOUNGER, a Greek writer who lived in the 2nd century of the Christian era. One work of his has been preserved, a story in five books, called "Ephesiaca; or The Loves of Abrocomas and Anthia."

**Xenos, Stefanos Theodoros** (zen'os), a modern Greek historical writer. He resided for many years in London. He wrote: "The Devil in Turkey; or, Scenes in Constantinople" (London, 1850); "The Heroine of the Greek Revolution" (1861), republished in the United States as "Andronike"; "East and West" (1865).

**Xenotime,** a tetragonal mineral occurring mostly in crystals; hardness, 4–5; sp. gr., 4.45–4.56; luster, resinous; color,

shades of brown, reddish, yellowish; opaque; composition: Phosphoric acid, 37.86; yttria, 62.14 = 100, yielding the formula $3YOPO_5$.

**Xenylamine,** $C_{12}H_{11}N$; martylamine; a crystalline body found in the basic oil which is obtained as a by-product in the manufacture of aniline. It forms white shining scales, slightly soluble in water, soluble in alcohol and ether, melts at 45°, boils at 320°, and distills without decomposition.

**Xenylenic Alcohol,**

$C_{12}H_{10}O_2 = \left.\begin{matrix}(C_{12}H_8)''\\ H_2\end{matrix}\right\} O_2$; diphenyl-alcohol or diphenylic acid; a diatomic alcohol obtained by the action of water on diazobenzidine nitrate. It crystallizes in small white needles, slightly soluble in water, soluble in alcohol and ether, and melts when heated. It dissolves readily in potash and in strong ammonia.

**Xeres, Francisco** (hār'ās), a Spanish historian, who lived in the 16th century, accompanying Pizarro, as his secretary, to Peru, about 1530. Of that expedition he wrote a detailed history, entitled "A True Account of the Conquest of Peru" (1549), still considered of great value as a source of information.

**Xeres,** or **Jerez de la Frontera,** a town in Southwest Spain, the Asta Regia of the Romans, and the seat of the wine trade in Spain, of which the principal wine is that so well known in England as sherry, an English corruption of Xeres. Xeres is a handsome and large town, of great antiquity. At the battle of Xeres, July 26, 711, Roderic, the last Gothic sovereign of Spain, was defeated and slain by the Saracens, commanded by Tarik and Muza. Pop. (1900) 63,473.

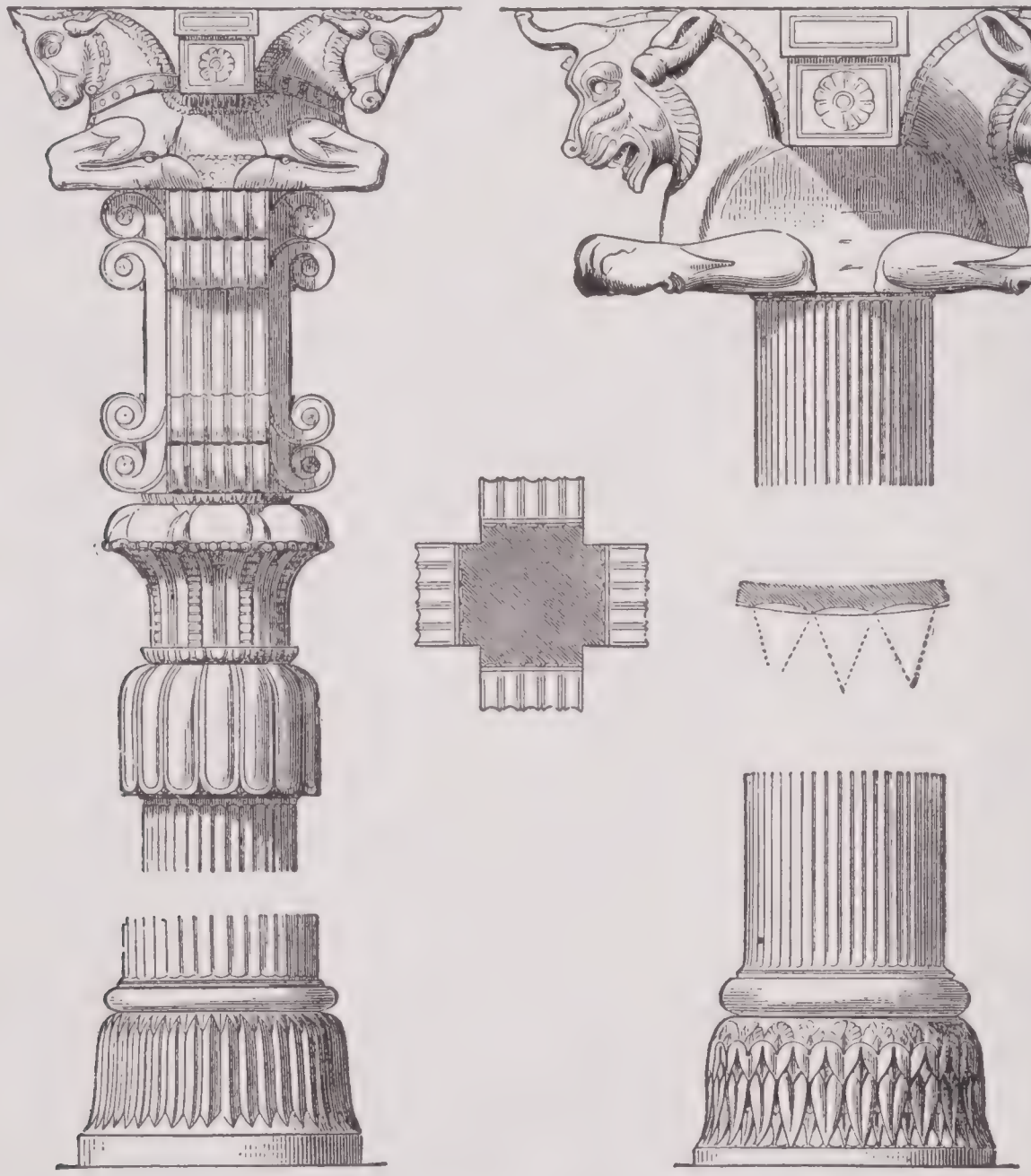
**Xerus,** a genus of *Sciurinæ*, with a few species, from Africa, where they burrow in the ground or among the roots of trees or bushes. There are two pairs of pectoral teats; tail comparatively short; fur mixed with flattened spines. The best known species, *X. rutilans*, is about 20 inches long, of which the tail forms nine; reddish-yellow above, paler on sides, whitish below.

**Xerxes I.,** King of Persia; the eldest son of Darius and his second wife, Atossa; was appointed successor by his father, in preference to Artabazanes, his eldest son by his fisrt wife, whose children were born before Darius became king. Darius died in the beginning of the year 485 B. C., in the midst of his preparations for a third expedition against Greece. Xerxes after having subdued the rebellious Egyptians, and appointed his brother, Achæmenes,, governor, gave his whole attention to the completion of the preparations begun by his father, which ocupied nearly four years. Immense hordes of men were gathered together from all parts of the vast Persian empire, from the steppes of Central Asia, from the banks of the Indus and its tributaries, and from the interior of Africa; an enormous fleet was furnished by the Phœnicians and other maratime nations subject to Persia; stores of provisions sufficient to support the immense army were collected at different points along the intended route of march. A bridge of boats, an English mile in length, under superintendence of Egyptians and Phœnicians, was built across the Hellespont. The bridge, however, was destroyed by a storm. Another bridge, consisting of a double line of boats, was built, and a canal was cut through Mount Athos, at the point of the peninsula of Acte, in Macedonia, on which the fleet of Mardonius had been wrecked in 492 B. C. The preparations were completed in 481 B. C., and in the autumn of the year Xerxes arrived at Sardis, where he wintered.

The following spring the vast assemblage began to march toward the Hellespont. It took seven days and nights to march across the bridge. After crossing the Hellespont, the march was continued along the Thracian coast toward Doriscus, on the Hebrus, where a halt was made on a large plain, and the army numbered. The fleet drew up near to Doriscus. According to Herodotus, the whole number of fighting men, military and naval, amounted to nearly 2,500,000, and the fleet consisted of 1,200 ships of war, besides 3,000 smaller vessels. These numbers were considerably increased during the march between Doriscus and Thermopylæ by the Thracians, Macedonians, Magnesians, and other nations through whose territory Xerxes passed on his way to Greece. Herodotus supposed that the number of people assembled on this occasion would be considerably over 6,000,000. This immense force moved on without resistance through submissive nations till it reached Thermopylæ, where it was brought to a stand by the army of Leonidas.

Though the Greeks were entirely defeated and slain, it was not without heavy loss to the Persians. On the same day, and on the third day after, the Persian fleet, which had previously suffered severely from a storm, was defeated with heavy loss by the Greeks off Cape Artemisium, in Eubœa. Xerxes continued his march on to Athens through Phosis, which he laid waste, and Bœotia, whose inhabitants joined him, with the exception of those of Platæa and Thespia, which cities he burned. A detachment which he sent to attack Delphi met with a signal defeat. When Xerxes arrived at Athens (in the summer of 480, three months after crossing the Hellespont) he found the city deserted, the Athenians having sent their fam-

ilies to Trœzen, Ægina, and Salamis. Athens was destroyed. Meantime the two fleets had sailed round from Eubœa, and taken up their positions in the narrow strait between Salamis and the Attic coast, where the famous naval battle of Salamis took place (September, 480 B. C.). Xerxes witnessed the fight from a lofty throne which he had caused to be erected on a slope of Mount Ægialeus. He was apparently confounded at the unexpected and inglorious result of all his mighty preparations to subdue



COLUMNS FROM THE GREAT HALL OF XERXES AT PERSEPOLIS.

Greece, and fled under the escort of 60,000 men. Little more is known of him, except that in 465 B. C. he was murdered.

**Xesibeland,** a region of South Africa; between Griqualand East and Pondoland; annexed to Cape Colony in 1886.

**Ximena,** the site of a battle in Southern Spain, between the Spanish army under the command of General Ballasteros, and the French corps commanded by General Regnier, Sept. 10, 1811. The Spaniards defeated their adversaries; the loss was great on both sides.

**Ximenes, August Louis** (ze-me-nes′), a French poet of Spanish descent;;born in Paris in 1726. Among his writings are several tragedies, notably one called "Don Carlos"; also a poem, "Cæsar in the Senate," and critical essays of value. He died in 1815.

**Ximenes, Enrico Emilio** (hē-mā′nes), an Italian miscellaneous writer; born in Palermo, Italy, May 14, 1857. He founded, in 1882, the daily journals "Vespers" and "Democracy" at Palermo. He wrote: "The Sicilian Vespers" (1882); "Ninna-Nanna" (1884), in verse; "Critical Study of Garibaldian Literature" (1885); "Correspondence of Guiseppe Garibaldi" (2 vols, 1886); "Syracuse in the Past and Present" (1887); "Anno Bonanno," a historical romance; "Two Years of History"; etc.

**Ximenes, Jacques** (hē-mā′nas), a Spanish poet, living in the 16th century. He took part in the war of the Netherlands; wrote a poem, "The Invincible Knight, the Cid Ruy Diaz of Bivar" (1579); and left a collection of sonnets.

**Ximenes, Rodrigo,** a Spanish prelate and historian; took part in the war against the Moors; and wrote a "History of Spain"; "History of the Huns and Vandals"; a "History of the Arabs"; and a "History of Rome." He died in 1249.

**Ximenes de Cisneros, Francisco,** a Spanish cardinal and statesman; born of a noble though poor family, in Tordelaguna, Castile, in 1436. He studied at the University of Salamanca, where he took the degree of bachelor both of civil and canon law. In 1455 he went to Rome, where he pled the cause of his countrymen in the consistorial courts with such success that he attracted the attention of the then pontiff. He returned in 1461 with an expective, which gave him a right to the first ecclesiastical preferment in a certain see that should fall vacant. A suitable office did fall vacant in 1473, but Carillo, Archbishop of Toledo, wished to fill it with a creature of his own. Ximenes refused to surrender his rights, whereupon the enraged prelate shut him up in prison for six years. Ximenes refused to yield, and at last attained his rights. Preferments of one kind and another followed; but he finally determined to leave the ranks of the secular for those of the regular clergy. He became a Franciscan, one of the straitest of sects.

But in vain he attempted to escape from the world. He was appointed guardian of the convent of Salzeda, in 1492 chaplain to Queen Isabella, and in 1495 Archbishop of Toledo. He was now an old man of 60, but more than a lifetime's work lay before him. He engaged in important civil and clerical reforms, and these his determined energy enabled him to carry through in the face of much opposition. He founded the University of Alcala (1500), endowed it magnificently, and made provision therein for the encouragement of every liberal art. He collected a body of learned men and a vast number of important manuscripts, and with such aid he compiled the famous polyglot Bible known as the "Complutensian Polyglot," a work which took 15 years, and cost a vast sum of money. He projected also an edition of Aristotle, but this his manifold labors did not allow him to complete. He violently converted a large number of the "infidels" of Grenada to the "true faith," and he carried on a victorious campaign against the Moors of Northern Africa.

On May 17, 1507, he was appointed cardinal, and when Ferdinand died in 1516-he ruled as regent for the young Carlos (afterward known as Karl V.) the whole of Spain. Here his prudent care disarmed the hostility of Ferdinand, the younger brother of Carlos (a youth whose pretensions to the crown were favored by many of the people), reconciled a discontented nobility, filled the royal treasury, and maintained the army and navy in a high state of efficiency. His regency lasted about two years. Then Carlos left the Netherlands for Spain. Almost his first act of sovereignty was the dismissal of the faithful regent. Ximenes was already on his deathbed, and it is doubtful if he ever knew of the act of the king. He died in Toledo, Nov. 8, 1517. Ximenes lived not for himself, but for his country, and still more for his Church. Without selfish motives or loose passions, he was worthy to be a prelate of imperial Rome and a statesman of imperial Spain. While clad in the almost royal purple of a cardinal, he still wore, beneath, the coarse mean robe of his order; and this was a fit type of his life, for while the one prefigured his vast power, the other still more aptly signified the life-long martyrdom of a soul that longed to be free; a martyrdom, historians tell us, that showed itself in the lines of a noble face furrowed with care and sorrow. See Prescott's "Ferdinand and Isabella."

**Ximenia,** a genus of *Olacaceæ,* with three or four known species; large shrubs or small trees, often spinous. Leaves entire, leathery; calyx very small, petals four, hairy inside; stamens eight, ovary with four cells, each one-seeded. *X. americana,* the false sandalwood, is a straggling Indian shrub; producing dull-white fragrant flowers, smelling like cloves, succeeded by small, oval, red or yellow pulpy fruits, an inch long, aromatic, but somewhat austere. They are eaten by the Hindus, and by the natives of Senegal. The kernels taste like filberts.

**Ximo,** or **Kiusiu** (ze'mo), the extreme S. of the three principal islands of Japan, in the Pacific Ocean, separated from Korea by the Strait of Korea, and from Niphon Island by the Strait of Sikoke; area, 16,840 square miles; pop. (1898) 6,811,246. It is mountainous, and has several volcanoes. Nagasaki, the chief commercial port of Japan, is on this island.

**Xingu** (shēn-gö'), a river of Brazil; one of the chief tributaries of the Amazon; it rises near lat. 15° S., lon. 59° W., and after flowing N. for 1,300 miles joins the Amazon 240 miles W. of Pará. Steamers can ascend it for 100 miles.

**Xiphias,** in ichthyology, a genus of *Xiphiidæ,* distinguished by the absence of ventral fins. The best known species is *X. gladius,* the common or Mediterranean swordfish. Günther says that the distinction of species is beset with great difficulties, owing to the fact that but few specimens exist in museums, and because the form of the dorsal, the length of the ventrals, and the shape and length of the sword appear to change according to the age.

**Xiphiidæ,** in ichthyology, the sole family of the acanthopterygian division. *Xiphiiformes,* with two genera, *Histiophorus* and *Xiphias.* The upper jaw is produced into a long cuneiform weapon.

**Xiphodon** (zif'ō-don), a genus of fossil mammals closely allied to *Anoplotherium.*

**Xiphoid,** in anatomy, applied to the ensiform or sword-like cartilage which terminates the sternum beneath. Applied also to a small, very thin, ligamentous fasciculus, which passes from the cartilage of prolongation of the 7th rib to the anterior surface of the xiphoid cartilage.

**Xiphosura,** an order of *Crustacea,* represented solely by the king crabs or *Limuli,* found in the West Indian seas, and also in the East Archipelago. The front segments of the body are united to form a broad shield-like plate or carapace of convex shape, while the posterior portion is elongated to form a terminal, sword-like, spinous tail (telson), from the presence of which the name Xiphosura, or "sword-tailed," has been given. On the upper and convex surface of the carapace, are placed the eyes, while the concave or under surface bears the locomotive and other appendages. In the Limulus there are 13 pairs of appendages, and of these, six pairs, in the form of legs, are attached round the margin of the oral aperture, the spines with which the basal or proximal joints of the legs are furnished subserving the function of a masticatory apparatus. Anteriorly, and in front of the mouth, a pair of chelate antennæ are also situated. The remaining feet are placed posteriorly on the abdominal surface in the form of broad plate-like structures, to which the respiratory organs are attached. The extinct group of the eturypterida were closely related to the Xiphosura. The two genera, *Pterygotus* and *Eurypterus,* are included in this group, the most familiar form being that of the *Pterygotus Anglicus.* Like the *Trilobites,* the *Eurypterida* are solely characteristic of the Palæozoic life-period.

**Xocojotzin.** See MONTEZUMA II.

**Xonaltite** (after Tetela de Xonalta, Mexico, where found), a massive mineral found associated with apophyllite and bustamite; sp. gr., 2.71; color, white to gray; tough; composition: Silica, 49.80; lime, 46.47; water, 3.73 = 100, equivalent to the formula $4CaOSiO_2 + H_2O$.

**X-Ray.** See ROENTGEN RAY.

**Xuares, Gaspar** (hwä'rās), a South American botanist, historian, and biographer; born in Santiago del Estero, Paraguay. Belonging to the order of Jesuits, he devoted himself to teaching philosophy and theology; after the suppression of his order he removed to Italy, where he occupied himself with botany. He wrote: "History of Buenos Ayres," and "Dissertations," both remaining in MS.; "Life of St. Francis Xavier"; etc. He died in Rome, in 1804.

**Xulinosprionites,** a genus of fruits with valveless, woody, two-seeded legumes. The pericarp unites in a singular manner the characters of a legume and a drupe. Two species are known. *X. latus* has the legume short and broad, with the apex umbonate, the epicarp rugose and mammillated, the sarcocarp, thin, and the endocarp thick. *X. zingiberiformis* has the legume lomentaceous, irregular; the epicarp somewhat coriaceous, the sarcocarp pithy, the cells very large, the endocarp thick. Externally it looks like a piece of ginger root, and it is not till it is fractured that it is found to be a legume. Both species are from the London Clay of Sheppey.

**Xulla Islands** (xool'la), a group in the Malay Archipelago, to the S. E. of the Molucca passage. It comprises Zulla-Bessey, Mangola, and Talyabo. The first has a length of about 400 miles.

**Xylander, Joseph Carl August** (ksi-län'der), a German military officer; born in Munich, Bavaria, in 1794. He wrote: "A Manual of Tactics"; "Strategy and its Application" (1818); and many other works, among them a "History of the War in Sweden in 1808–1809" (1825). He died in 1854.

**Xylaria,** a genus of *Sphæriacei;* branched, horny, or fleshy fungals, often with clavate lobes, whitish and mealy when young, afterward brown or black. Perithecia horny; usually immersed all over the branches; center black, composed of asci, with eight usually uniseptate spores. The largest species are tropical, but several are found in Europe on rotten wood, stumps of trees, etc. The most common is *X. hypoxylon.*

**Xylem,** Naegli's name for one or two groups into which the permanent tissues of a fibro-vascular bundle can be divided. It is composed of parenchymatous cells, wood fibers, vascular cells, and true vessels, in which the walls of the cells generally become ligneous. From it the wood is developed.

**Xylene,** or **Xylol** ($C_8H_{10}$), one of the aromatic hydrocarbons, being a homologue of benzene ($C_6H_6$), and sometimes known as dimethyl-benzene from the supposition that it is formed from benzene by the substitution of two molecules of methyl ($CH_3$) for two hydrogen atoms. It is a colorless liquid, boiling at 140° C. When passed through a red-hot tube xylene is resolved into a mixture of several homologous hydrocarbons.

**Xylene Sulphochloride,** $C_8H_9SClO_2 = C_6H_3(CH_3)_2 \cdot SO_2Cl$; a yellow oil obtained by triturating xylene-sulphate of sodium with phosphorus pentachloride, warming the mixture, and pouring the product into water.

**Xylene Sulphuric Acid,** $C_8H_{10}SO_3 = C_6H_3(CH_3 \cdot {}_2SO_2H$; xylosulphuric acid; sulphoxylolic acid; produced by the action of concentrated sulphuric acid on xylene. It is very soluble in water, and by dry distillation is reconverted into xylene. With the oxides it forms salts called xylene sulphates, its potassium and sodium salts being soluble in water and alcohol, and crystallizing from the latter in silky laminæ.

**Xylidic Acid,** $C_9H_8O_4 = C_6H_3(CH_3)(CO \cdot OH)_2$; obtained by oxidizing pseudo-cumene, xylic acid, and paraxylic acid with dilute nitric acid. It forms colorless crystals, slightly soluble in water, and melts at 280° to 283°.

**Xylidine,** $C_8H_{11}N = C_8H_9(NH_2)$; amidoxylene. Amidoxylol or xylenylamine; a base homologous with aniline, produced by the action of ammonium sulphide or stannous chloride on nitroxylene. It is a colorless liquid, heavier than water, and boiling at 215°. Heated with tin and hydrochloric acid, it solidifies on cooling to a crystalline mass, which appears to be a compound of xylidine hydrochlorate with stannous chloride.

**Xylina,** in entomology, the typical genus of *Xylinidæ*. Antennæ slightly ciliated in the male; abdomen depressed, somewhat crested; fore wings narrow, elongate, the edges nearly parallel. British species three, the conformist *X. conformis*, the non-conformist, *X. zinckenii*, and the gray shoulder knot, *X. rhizolitha*.

**Xylobius,** a fossil genus of *Myriapoda* occurring in rocks of Carboniferous age, within the hollowed trunks of *Sigillaria*, one of the most characteristic trees of the coal epoch. Xylobius had the power of rolling itself up for protection into a ball-shaped form.

**Xylography,** a mode of printing or graining from the natural surface of the wood. A piece of wood is selected of fine quality, having the pattern of grain desired. The surface is treated chemically to open the pores. After it is dry the surface is painted and a sized sheet of paper laid over the board, and both run together between rollers in the manner of copper-plate printing. The paint is then transferred to the board, the difference in the absorbent qualities of the board determining the depth of color. The paper is laid face downward on the article to be ornamented, and rubbed on the back with a soft pad to transfer the impression.

Also a name given to a process of decorative painting on wood. A selected pattern or design is drawn on wood, which is then engraved, or the design is reproduced in zinc by the ordinary method. An electrotype cast is taken from the woodcut or zinc plate, and smooth surfaces of wood are printed from the stereotype under regulated pressure with pigments prepared for the purpose. The color penetrates the wood, leaving no outside film, and after being French polished, or covered with a fluid enamel, the wood may be rubbed, scrubbed, or even sand-papered without destroying the pattern.

**Xyloidin,** in chemistry, $C_6H_9NO_7 = C_6H_9(NO_2)O_5$, pyroxam, nitramidin, or explosive starch, an explosive compound, discovered by Braconnot in 1833, and prepared by triturating starch with fuming nitric acid till it is reduced to a semi-fluid mass, and adding 25 parts of water. It is a white, inodorous and tasteless powder, insoluble in water, alcohol, ether, and chloroform, slightly soluble in glacial acetic acid. When struck with a hammer it detonates, melts when heated, and bursts into flame at 180°, leaving a carbonaceous residue; 100 parts of starch yield 130 parts of xyloidin.

**Xylophaga,** the name applied (1) to a group of beetles resembling weevils, but destitute of a beak, and noted for their habit of excavating wood; (2) to a family of *Diptera* or flies, of which the chief genus is *Xylophagus*. In this group the antennæ are 10-jointed, and there is a long ovipositor. The larva is cylindrical, and has a scaly plate on the tail, the head ending in an acute point.

**Xylophone** (zy'lo-fōn), a musical instrument consisting of bars of wood or glass graduated in length and resting on belts. The notes are produced by striking on the bars with small hammers.

**Xylophylla,** a genus of *Phyllantheæ*, sometimes reduced to a sub-genus of *Phyllanthus;* shrubs, without leaves, but with leaf-like branches, bearing the flowers on notches in their margin. Natives of the tropics, especially of the West Indies, where they are called seaside laurels and love flowers.

**Xylopia,** the typical genus of *Xylopeæ;* trees or shrubs, with oblong or lanceolate leaves and axillary bracteate peduncles, one or many flowered; calyx, three to five lobed, the segments ovate, acute, coriaceous; petals six, in two rows, the outer three the largest; stamens, many, inserted into a globose receptacle; carpels, 2 to 15, each with one or two seeds; known species about 12, some of which are often placed in the genus *Habzelia*. Natives of South America and the West Indies. They readily strike root when a small fragment of them is placed in the ground. *X. sericea*, the pindaïba of Rio Janiero, bears a highly aro-

matic fruit, which may be used as pepper, with which it agrees in its flavor. Good cordage is made from the fibers of its bark. The wood, bark, and berries of *X. glabra*, the bitter wood of the West Indies, taste like orange seeds, and impart a similar flavor to the wild pigeons which feed on them. It is said to be useful in colic and for creating an appetite. Martius believes the fruit of *X. grandiflora* to constitute a valuable febrifuge used by the South American Indians. The dry fruits of *X. aromatica* form the *Piper æthiopicum* of commerce, used as pepper by the West African negroes.

**Xylylic Acid,** $C_9H_{10}O_2=C_6H_3(CH_3)_2CO_2H$, a crystalline body obtained by oxidizing cumene with potassic dichromate and sulphuric acid. It is sparingly soluble in boiling water, very soluble in alcohol and ether, melts at 103°, and boils at 273°. On treating it with chromic acid, it is converted into insolinic acid.

**Xyridaceæ,** xyrids; an order of endogens typical of the alliance Xyridales; herbaceous, sedgy plants, with fibrous roots; leaves radical, ensiform, or filiform, with enlarged, scarious, sheathing bases; flowers in terminal, imbricated, scaly heads; sepals three, glumaceous; corolla gamopetalous, with three thin, long, and colored petaloid divisions; fertile stamens three, others, alternate with the divisions of the corolla, sterile; style trifid; ovary single, one-celled, with parietal placentæ bearing numerous ovules; fruit capsular, three-valved. Chiefly natives of the tropics. There are two genera, *Aboldoba* and *Xyris*.

**Xyris,** the typical genus of *Xyridaceæ;* sedge-like plants, with narrow, radical leaves, and scapes bearing heads of yellow, fugaceous flowers; known species about 50, chiefly from tropical America, but a few from the hotter parts of the Eastern Hemisphere. The leaves and root of *X. indica* are given in India against ringworm, itch, and leprosy; those of *X. americana* and *X. vaginata* are used for a similar purpose, the former in Guiana, the latter in Brazil.

**Xysmalobium,** a genus of *Asclepiadaceæ;* erect perennial shrubs with large flowers in umbels; corolla bell-shaped with spreading segments, staminal corona at the top of the tube of filaments, consisting of 10 parts in a single series; known species eight or nine, all but one from the Cape of Good Hope. The remaining one, *X. heudelotianum,* is from Senegambia, where its root is eaten by the negroes. *X. padifolium* is cultivated in English gardens.

**X. Y. Z. Correspondence,** in United States history, the name given to the dispatches of the three commissioners to France, Marshall, Pinckney, and Gerry, containing the insulting demands made by Talleyrand and the other French Directors as the price of respect and courtesy to the American republic. In the otherwise complete copies published by Congress President Adams substituted X. Y. and Z. for the names of Tallyrand's emissaries. To the demands the United States representatives returned a decided refusal. It is said that Pinckney, in response, made use of the phrase, "Millions for defense, but not one cent for tribute."

**Y**, the 25th letter of the English alphabet, in modern English, both a consonant and a vowel. It is taken from the Latin, into which language it was adopted from the Greek (v) or upsilon. It sometimes represents an Anglo-Saxon character which is supposed to have a sound resembling that of the French u or German ü.

At the beginning of syllables, and when followed by a vowel, y is a palatal consonant, being formed by bringing the middle of the tongue in contact with the palate, nearly in the position to which the g hard brings it. Hence, the Anglo-Saxon hard g has often been softened to y, as in day = Anglo-Saxon *dag*, may = Anglo-Saxon *mag*, etc. In words of Romance origin y frequently represents:

(1) French -ie = Latin -ia, as in barony, company, copy, jolly, family, memory, victory, etc. (2) Latin -ium, as augury, horology, remedy, study, etc. (3) Latin -atus, as attorney, deputy, ally, quarry. (4) French -if; Latin -ivus, as hasty, (= Old French *hastif*), jolly (= Middle English *jolif;* Old French *joli*, fem. *jolive*), testy, etc. (5) Many words ending in y have come through Latin nouns in -ia (= French -ie), from Greek -ia, -eia, as analogy, apology, blasphemy, philosophy, etc. (6) As an adjective termination, y generally represents the Anglo-Soxon -ig, as in stony = Anglo-Saxon *stánig*, hungry = Anglo-Saxon *hungrig*. So also in some nouns it represents Anglo-Saxon -ig, as in honey = Anglo-Saxon *hunig*. In the suffix, -ly it is both an adjectival and an adverbial suffix, and represents the Anglo-Saxon -ic, -ice, or -iche, as godly = Anglo-Saxon *godlic*, friendly = Anglo-Saxon *freóndlic*, hardly = Anglo-Saxon *heardlice*. In nouns ending in -ty, this ending represents the French -té, Latin = tatem (nominative -tas), as in vanity (= French *vanité*, Latin *vanitatem*, accus. of *vanitatas*), calamity, etc.

In the middle, and at the end of words, y is a vowel, and is precisely the same as i. when accented it is pronounced as i long, is in dē-fy′, dy′ĭng, etc., and when unaccented as i short, as in glör-y, jŏl-ly, cĭt-y, etc. Y sometimes called the Pythagorean letter, from its Greek original in its form of three limbs representing the sacred triad formed by the duad proceeding from the monad. In chemistry, Y is the symbol of yttrium. As a numeral, it stands for 150, and with a dash over it for 150,000. Y- is a common prefix in Middle English words, and represents the Anglo-Saxon -e or ge-, as in *yclept, yclad.* It is the same as ge-.

**Yablonoi.** See STANOVOI.

**Yacht** (yät), a decked pleasure vessel; a light and elegantly fitted-up vessel, used either for racing or for pleasure trips, or as an official or state vessel to convey royal personages or government officials from place to place. The rigs are various, and many pleasure yachts now have steam power as an accessory, or for use during calms. Racing yachts are built with very fine lines.

The use of steam has been a great factor in the increase of interest in private yachts, and these expensive toys are yearly becoming more numerous and more elegant. None but millionaires can indulge in such costly adjuncts to their establishments. The cost of steam yachts varies widely even without taking into account the expenditures for furnishings. A yacht 160 feet in length may be built for $60,000, while one of the 300-foot boats, the largest type, will cost from $400,000 to $500,000. Add to this the cost of maintaining such a vessel, which in no case falls below $6,000 annually, and it will be seen that a small fortune can easily be spent on this one pleasure. During the year 1899, 12 high-class steam yachts were built on the Atlantic coast alone, whose aggregate cost, exclusive of interior furnishings, was between $3,000,000 and $4,000,000. The largest of these vessels are the "Aphrodite," built for Col. O. H. Payne, and the "Corsair," owned by J. Pierpont Morgan, both of New York city. The "Corsair," refitted for service as a war vessel, and offered to the government for use in the American-Spanish War, made a notable record under her new name, the "Gloucester," especially by the destruction of the two Spanish torpedo boats, "Furor" and

"Pluton," during the memorable naval battle of Santiago, July 3, 1898. One of the handsomest and most superbly fitted private yachts, though not of the largest class, is the "Niagara," owned by Howard Gould. It cost $500,000, and requires $10,000 a month to keep it in commission. The "Margarita II.," built for Anthony J. Drexel, the Philadelphia banker, was very large and finely equipped. William K. Vanderbilt owns the "Valiant," 332 feet long, and probably the largest American private yacht afloat. The "Mayflower" and "Nahma," owned by the Goelets, were built on the Clyde, The most magnificent private yachts owned in Europe are the "Hohenzollern," belonging to the Emperor of Germany, which visited New York in February–March, 1902, and the "Atmah," built for Baron Edmond de Rothschild. Queen Victoria was always fond of yachting and had a new one built in 1899. A small steam yacht, the "Sylph," was fitted up for President McKinley as a private yacht, to take the place of tugs and other ordinary craft, formerly used by the Chief Executive.

The first recorded yacht race was one in which a vessel of Charles II. defeated a Dutch racer and one belonging to the Duke of York. The course was from Greenwich to Gravesend and back, and the stake 100 guineas ($500). The oldest British yacht club was formed at Cork, Ireland, and dates back at least to 1720. In 1812 the Royal Yacht Club of England was organized. The New York Yacht Club, an outgrowth of a Hoboken sailboat club, was started with nine members. In the first stated match sailed by the club, the schooner "Cygnet" won. Little attention was paid in the United States to the building of yachts till 1846, when Commodore Stevens and his brother, Edwin A. Stevens built the "Maria." This vessel was the largest sloop-rigged pleasure craft up to that time. It was at first intended to send her to the World's Fair at London, in 1851, but the "America," designed by George Steers, of New York, and built by the Stevens brothers, was ultimately chosen. Commodore Stevens crossed the Atlantic in the "America," and entered her in the race of Aug. 22, open to all yachts, for a $2,500 cup. The course was around the Isle of Wight and the "America" beat the whole field of 18 yachts by about 7 miles. On Aug. 28 she sailed a race with the English schooner "Titania" over a 40-mile course winning an overwhelming victory. The achievements of the American yacht had a marked effect on the work of British ship-builders. It was not till 1870 that an effort was made to regain the "America" cup. For a record of the races from 1870 to 1899 for that trophy see AMERICA'S CUP. On Sept. 28, 1901, the "Columbia" defended the cup against the "Shamrock II.," winning by 1 minute, 20 seconds in a race of 4 hours, 30 minutes, 24 seconds. Oct. 3, 1901, the same boats competing, a race of 3 hours, 12 minutes, 35 seconds, was won by the American yacht by 3 minutes, 35 seconds. In the race on the following day, the British yacht finished first in a race of 4 hours, 32 minutes and 57 seconds, but on a time allowance of 43 seconds, the "Columbia" won by 41.

Several trans-Atlantic races have tested the seagoing qualities of modern yachts. In 1866 the schooners "Henrietta," "Fleetwing," and "Vista" raced from Sandy Hook to the Needles, Isle of Wight, for stakes amounting to $90,000. The "Henrietta" won in 13 days, 21 hours, 55 minutes, averaging 9½ knots for 3,106 miles, The "Fleetwing" sailed 3,005 miles, and the "Vesta" 3.046 miles. On July 4, 1890, the schooners "Cambria" and "Dauntless" raced from Old Kinsale Head, Ireland, to Sandy Hook. The "Cambria" won. She sailed 2,881 miles in 23 days, 5 hours, 17 minutes. The "Dauntless" sailed 2,783 miles in 23 days, 7 hours. The schooners "Coronet" and "Dauntless" sailed a match race for $10,000 a side in 1887. The start was made off Bay Ridge, Long Island, on March 12, and the race ended at Queenstown, Ireland. The "Coronet" won. She sailed 2,949 miles in 14 days, 23 hours, 30 minutes. The "Dauntless" sailed 2,947 miles in 16 days, 1 hour, 43 minutes.

Among the designers of American and British racing vessels John Harvey and Beavor-Webb, of England, George Lennox Watson and William Fife, of Scotland, and Edward Burgess and N. G. Herreshoff, of New England, have been especially prominent.

**Yacou.** See GUAN.

**Yadkin.** See PEDEE.

**Yadrintsef, Nikolai Michailovitch,** a Russian author; born in Siberia in 1842. When a young man he was accused of a conspiracy having in view the independence of Siberia, and was exiled to Archangel, but later was permitted to return to Siberia, where he was appointed on the staff of Governor-General Kaznakof. Between 1865 and 1875 he traveled extensively in Siberia, publishing the results of his explorations. In 1882 he founded the "Eastern Review," a popular and influential weekly devoted to the interests of Asiatic Russia. He made in 1891–1892 careful explorations in Mongolia, where he discovered the ruins of the ancient capital of the Tartar Khans, and made archæological collections of great value. In 1893 he visited the United States. He was the founder of the Siberian University, and a promoter of universal education. Among his works are: "The Russian Com-

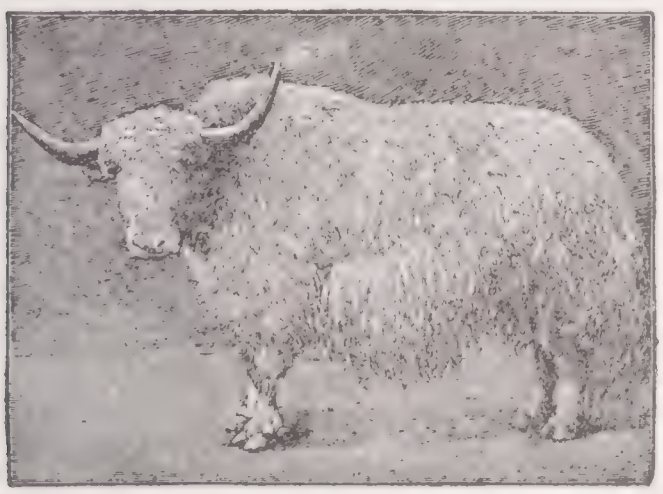
mune in Prison and in Exile"; "Siberia as a Colony"; "The Culture and Industrial State of Siberia," etc. He died in Barnaul, in the Altai Mountains, June 19, 1894.

**Yaguarundi,** a carnivorous quadruped of the genus *Felis,* found from the Rio Grande to Paraguay. It is larger than the common cat, with a much longer body. Its prevailing color is a grizzled brownish-gray.

**Yahoo,** a name given by Swift in his "Gulliver's Travels" to a race of brutes, described as having human forms and vicious and degraded propensities. They were subject to the Houyhnhnms, or horses endowed with human reason. Hence, the term is applied to a rough, low, boorish, or uneducated person.

**Yajur Veda,** in Hindu sacred literature, the third portion of the Veda, generally called the third Veda. It consists not merely of verses from the Rig Veda, but also of prose sentences used at the offering of certain sacrifices. There are two editions called the Black and White Yajur. See VEDA.

**Yak,** the native name for the *Poephagus grunniens,* a species of ox from the mountainous regions of Tibet. There are two



THE YAK.

races: the wild yak, generally black, which is found near the snow line, descending into the valleys in winter, and a domesticated race of various colors, black and white being most common. The yak is about the size of the common ox, to which it has a general resemblance, but it is covered with a thick coat of long, silky hair, hanging down like the fleece of a sheep, completely investing the tail, and forming a lengthy fringe along the shoulders, flanks, and thighs. This fringe, which exists in both races, was apparently developed as a protection to the animal in its alpine haunts, as the long hair forms a sort of mat which defends the body from the effects of the cold when the animal is reposing in the snow. The domesticated race is of great importance to the natives of Tibet. The yak is employed as a beast of burden, but never for tillage or draught; the milk is very rich, and yields excellent butter; the flesh is of the finest quality, and that of the calves far superior to ordinary veal. The hair is spun into ropes, and made into coverings for tents, and the soft fur of the hump and withers is woven into a fine strong cloth. The tails, often dyed red, are made into the chowries or fly-flappers, used in India. Yaks are aften seen in zoölogical gardens and menageries, and have repeatedly bred in Europe, and it is probable that they might be advantageously introduced into the Highlands of Scotland and the N. parts of the Continents of America and Europe.

**Yakhontov, Alexander Nikolaiewich** (yä-kon-tof'), a Russian author; born in the province of Pskov, Russia, June 28, 1820. He held a number of important positions in his native district. He wrote for Russian journals (1843–1889), a mass of lyrical and satirical poems, from which appeared a "Collection" in 1884, and published also several popular historical and scientific works and translations, and translations from Goethe and Lessing.

**Yakima,** or **Yakama,** a tribe of Indians first observed on the headwaters of the Cataract and Yakima rivers, Washington, in 1805. The name has lately been used to designate members of some other tribes having little or no connection with the Yakima proper. There now remain about 900 members of this tribe, located on a reservation in Washington.

**Yakima,** a river of Washington, rising in the Cascade Mountains, and flowing S. E. into the Columbia, which it joins about 10 miles above the mouth of the Snake river. Its valley is irrigated, and is one of the most fertile in the State. The Yakima traverses a region with important coal mines. Length, about 175 miles.

**Yakima Pass,** a pass over the Cascade Mountains in the State of Washington; is about 3,600 feet high; and is crossed by the Northern Pacific Railroad; latitude, about 47° 20′ N.

**Yakoman Indians,** a family of North American Indians divided into four tribes: the Yaquina (Yakwina or Yakones), Alsea, Sinslaw, and Ku-itc (also called the Lower Umpqua tribe).

**Yakoub Beg,** surnamed KHUSHBEGI ("lord of the family"), and ATALIK GHAZI ("victorious guardian"); ameer of Kashgar; born near Samarcand, Russian Turkestan, early in the 19th century. His lineage and race are doubtful, but he originally appeared as chamberlain to Khudayar Khan, the Mohammedan conqueror of Khokand, then a Chinese possession. He became successively a commander of 500 soldiers, governor of the Ak Musjid

("White Mosque"), on the Jaxartes, where in 1853 he stubbornly resisted the advance of the Russian general, Perovsky, and governor of Kurama. At this time he had the reputation of being a brave soldier, an orthodox Mohammedan, and a stern disciplinarian. But he first rose to great eminence after the recovery of Kashgar from the Chinese in 1864. In the course of three years he had firmly established his power. For 12 years this remarkable man conferred on a large part of Central Asia the benefits of a settled though rigorous government. He drilled and disciplined a large civil staff. He presented to his subjects the spectacle about which Indian administrators now and then dream, of a monarch who held a public durbar to which the meanest had access, who received all kinds of petitions, who passed orders by a sort of instinct on piles of reports, who punished delinquent officials for malpractices, who whipped vagrants and beggars, drove idlers to say their prayers at mosques, checked sedition, and forced women to go about in modest veils. In his foreign policy he was strongly anti-Russian, and ultimately friendly to Great Britain. In 1874 a commercial treaty was concluded between him and Sir Douglas Forsyth to develop intercourse between India and Kashgar. But in the spring of 1877 he was assassinated, though another account attributes his death to fever, and the fabric he had so laboriously raised fell to pieces almost immediately. The Chinese armies overran the country (1878), and Kashgar again came under Chinese rule.

**Yakoub Khan,** Ameer of Afghanistan; born in 1849; son of Shere Ali; was nominated heir to the throne of Kabul in 1864. Appointed governor of Herat, he became extremely popular, and succeeded in maintaining his father's authority in that province when the rest of Afghanistan passed under the rule of the rival ameers, Afzul and Azim. It was owing to his admirable generalship that Shere Ali regained his throne in 1868, and when the latter visited India in the following year, Yakoub Khan was appointed governor of the capital. In 1870 he was made governor of Kandahar, and afterward was sent a second time to Herat, where, however, his great influence excited the fears and suspicions of Shere Ali, who now declared his youngest son, Abdullah Jan, to be his heir, and sought to prejudice the British government against Yakoub Khan, by falsely representing him as hostile to British interests. Captain Marsh, who visited him at Herat in 1872, found him exactly the reverse. In 1873 Shere Ali recalled him from Herat, but he declined to return, and for a year was practically in revolt. At length, under the most sacred pledges of safety, he proceeded to Kamul, but was treacherously imprisoned, and was only released when the flight of his father before the victorious advance of the British arms in the war of 1878 made his presence indispensable to prevent anarchy in the capital and the State. On the death of Shere Ali he succeeded to the throne, and on May 30, 1879 concluded a treaty of peace with the British. Shortly after the murder of Cavagnari in the following September, in which he was suspected of complicity, he fled to the army that General Roberts hurried forward to punish the Kabul assassins, was detained a prisoner by the Indian government; and was deposed in 1880.

**Yakutsk,** a city and capital of the province of Yakutsk, Siberia; on a branch of the Lena river, 4 miles from the main stream. The city was founded in 1632 as a Cossack station and is the seat of the governor and provincial authorities. It has regularly laid out streets, wooden houses, a cloister cathedral, a pro-gymnasium for boys and girls, and several primary schools. It is the trading center of Northern and Eastern Siberia, and carries on an extensive commerce in hides, furs, tallow, fish, mammoth bones, and reindeer. A great fair is held here annually from June 22 to Aug. 13, and is frequented by the natives from all over the province, with proceeds estimated at $2,500,000. Pop. (1900) 6,535.

**Yakutsk,** or **Jakutsk,** a province in East Siberia, Russia, embracing the valley of the Lena river; bounded by the Yeniseisk, Irkutsk, Transbaikal, and Amur provinces, by the Arctic Ocean, and by a narrow strip of the district of Ochotsk. The population consists mainly of Yakuts, Yukagirs, and Tunguses, occupied in hunting, fishing, and as nomads overseeing large herds of cattle and horses. The Russian element is quite small, embracing a few thousand exiles and soldiers, living in about 20 villages. The country is rugged, consisting mainly of an elevated plateau, covered with forests and marshes. These marshes are frozen to a depth of several hundred feet. The forests abound in fur-bearing wild animals; the rivers with fish. Gold mining is carried on extensively in the S. W. Yakutsk is the largest Siberian province, embracing nearly one-third of Siberia, and is nearly as large as European Russia; area, 1,533,397 square miles; pop. (1909) 308,300.

**Yale, Elihu,** an Anglo-American philanthropist; born in Boston, Mass., April 5, 1648; son of an English colonist. He went to England while very young and was there educated, never returning to America.

About 1678 he went to the East Indies as a trader, and acquired great wealth. From 1687 to 1692 he was governor at Fort St. George, Madras. He gave to the Saybrook Collegiate School books and money valued at $4,000, a gift which resulted in the connection of his name with the college after its removal to New Haven. His full-length portrait hangs in Alumni Hall, Yale University. He died in London, July 8, 1721, but was buried at Wrexham, Wales. His epitaph contains the following well-known lines:

"Born in America, in Europe bred,
In Afric travel'd, and in Asia wed,
Where long he liv'd and thriv'd; at London dead."

**Yale, Linus,** an American inventor; born in Salisbury, N. Y., April 4, 1821; applied himself for a while to portrait painting, but in 1850 began to study mechanical problems. In 1851 he patented a safety lock, and thereafter till his death was a recognized authority on all matters pertaining to locks and safes. In the course of his work he became convinced of the necessity of abandoning the use of a keyhole as affording an easy means of introduction to the lock mechanism. This led to the adoption of the permanent dial and shaft as used in the combination locks, and subsequently to the perfection of what is known as the "clock" lock. His most notable invention was the double lock, which comprised two locks within a single case, and operated by the same or different combinations. He was the recipient of gold, silver, and bronze medals as first awards at various expositions. He died in New York city, Dec. 24, 1868.

**Yale University,** an institution of higher learning in New Haven, Conn.; founded in Saybrook in October, 1701, as the Collegiate School of the colony under the trusteeship of 10 principal ministers The classes were taught, however, at Killingworth, now Clinton, an adjoining town, till 1707. The institution was permanently settled in New Haven in 1716, and in 1718 its name was changed to Yale College in honor of Elihu Yale. The name Yale College applied at first only to the new building. It was given formally to the institution in its charter of 1745. The chair of Divinity was added in 1755, and another of Mathematics, Physics, and Astronomy in 1771, though this was not permanently filled till 1794. Occasional grants were made to it by the legislature before the Revolution, and $30,000 was voted by the State in 1792. Schools of Medicine (1812), Theology (1822), and Law (1824) were established; and, as reorganized in 1871, the university possesses also departments of Philosophy and Arts, the latter including besides the classical course of "Yale College" proper, the Sheffield Scientific School (begun 1847, endowed 1869), post-graduate courses, and a School of Fine Arts (1864). A great part of the studies in the third and fourth years is elective. The University Library, including Linonian Brother's Library, the Law Library, the Sheffield Scientific School Library, the Trowbridge Reference Library of the Divinity School, the Lowell-Mason Library of Music, the Library of Foreign Missions and Art, the Medical School and American Oriental Society Libraries, consists of 315,000 volumes and 30,000 pamphlets. The numerous buildings cover about nine acres in the heart of the city, the oldest dating from 1752. The Trumbull gallery consists of historical portraits and works numbering 54 pictures. The Jarvis Gallery of Italian Art has 122 paintings, dating from the 11th to the 17th centuries. The Alden collection of Belgian wood carvings of the 16th century comprises about 150 feet of wainscoting and three confessionals from the Chapel in Ghent and a collection of about 50 paintings.

In March 1887 an act passed the General Assembly of the State authorizing the use of the title Yale University by the president and fellows of Yale College. The president is the presiding officer of the Board of Trustees and of every board of instruction. He has no required duties of teaching. There are four departments of instruction, viz.: Philosophy and the Arts, Theology, Medicine, and Law. Under the first-named department are included two separately organized sections, in which instruction for undergraduates is provided, viz.: the Academical Department and the Sheffield Scientific School; also the School of the Fine Arts, and the Department of Music, each with a special organization; and the courses for graduate instruction, under the combined faculty of the department.

The Library, the Peabody Museum of Natural History, and the Observatory are severally organized independently of the special departments, and are designed to contribute, in their appropriate spheres, to the instruction and advancement of the whole institution.

On Oct. 20–24, 1901, the university celebrated its bi-centennial with impressive ceremonies. At the close of 1901 the official reports showed: Professors and instructors, 280; students, 2,680; volumes in the library, 315,000; productive funds, $5,000,000; benefactions, $428,000; income, $770,000; number of graduates, 20,278.

The following is a list of the presidents since its foundation: Abraham Pierson (1701–1707); Samuel Andrew (1707–1714); Timothy Cutler (1719–1722); Elisha Williams (1726–1739); Thomas Clap

(1740–1766); Naphtali Daggett (1766–1777); Ezra Stiles (1777–1795); Timothy Dwight (1795–1817); Jeremiah Day (1817–1846); Theodore D. Woolsey (1846–1871); Noah Porter (1871–1886); Timothy Dwight (1886–1899); Arthur T. Hadley (1899–).

*The New Yale.*— The election of President Hadley was generally accepted as meaning that another chapter in the history of Yale had been begun. It was thought especially significant that the man chosen to be the head of the university when it should enter its third century was still a young man, that he was an investigator and scholar of the modern type, trained in Germany as well as in his college, and that he was not a clergyman — the first layman to occupy the presidency. His candidacy received the support of the body of the alumni and of the faculty; but the greatest enthusiasm for him was among the younger men; and some ultraconservatives were for a time not without forebodings that too wide a departure from the lines of Yale's past development might follow his election.

In the past the most valuable characteristic of the training received at Yale has been that it makes a man socially useful. The typical Yale man is a man of high ideals, and at the same time practical, American, democratic. Intellectual isolation and ineffectiveness are not qualities which flourish in her atmosphere.

But many changes have come over college life in the last few years. Some of these are due to new social conditions, some to new educational requirements and opportunities. The old Yale of the brick row, of plain living, of narrow curriculum and severe discipline is left behind. American life is no longer what it was 40 years ago. During the same period the intellectual world has been revolutionized. Both these facts have profoundly affected the colleges. Are they likely to affect the broad result on character of college life?

There are many ideals of what a university should be. One is the ideal of a place where everything that is known is taught, and where new knowledge is being discovered; a place where specialists are trained. Another is that of a place where gentlemen gather for the leisurely pursuit of that liberal culture which is the possession of the finest aristocracy — the aristocracy of intellect. Another is that of a place where each student gains the fullest development of his individuality — where personalities are set free. But no one has emphasized so strongly as President Hadley the conception of the university as a place for the making of citizens, for training men to public service, to social usefulness. Whatever changes in college life and in educational methods may come, the aim of Yale is to continue to do what it has been doing in the past.

Yale University

The duties which have fallen to Yale's new president were determined by the position which the institution had reached when he succeeded to the office. The last 15 years have been years of rapid growth. The old brick row of dormitories and recitation buildings has melted away before the quadrangle — the evidence of freer student expenditure and larger needs of instruction. In 1880 there were 612 college undergraduates; in 1890, 832; in 1899, 1,224. The collegiate faculty in the same years numbered respectively 30, 53 and 113. Twenty years ago the academical course was almost wholly prescribed; in 1890, two-thirds prescribed, with 119 elective courses open for the remainder of the work; in 1901 there were 273 undergraduate elective courses, with rigidly required work limited to freshmen and three hours of junior year. No sophomore now has to take either Latin, Greek, or mathematics.

Meanwhile around the college has formed the university. The change in corporate name was made in 1886. At that time the number of buildings was 31; there are now 46. The endowment in the former year was about $2,200,000; in 1900, over $5,300,000.

President Dwight's accession to the presidency in 1886 was at the end of an epoch. The old system of prescribed studies throughout the academical course had given way for the upper classes in 1884. The antiquated fashion of electing tutors on their general scholarship record, and afterward assigning them to teach whatever subject happened to be needed, continued nearly to the end of President Porter's administration. The number of students began to leap upward in 1886. In 1835, 135 men entered the academical department; in 1885, 134; during these 50 years the largest class numbered 149. Since the fall of 1887 no class has entered with less than 200 men, and the present size approaches 350.

In the Sheffield Scientific school the freshman class of 1884 numbered 81; in 1891, 200. The entire university contained in 1880 about 1,000 students, in 1890, 1,600, in 1911, over 3,500.

Three things, then, stand out regarding the last 15 years of Yale's history: that they have been characterized by a great increase in the number of students, a great increase in the range of studies, and a great increase in the endowment and number of buildings.

The last fact is partly, but not wholly, the result of the first two. It takes a larger endowment to do the same work now than a half century ago; salaries are (fortunately) higher, and returns on investments lower. Besides, a higher standard of living in the community at large has made necessary better student accommodations. Two generations ago students generally sawed

their own wood, threw slops out of the window, and were strangers to the luxury of a carpet. In dormitories of the old brick row, cold water ran from one faucet on the ground floor and was carried upstairs by the students themselves, unless they paid for extra services. Dormitories are now supplied with private bathrooms on each floor. The barn-like, unventilated, poorly lighted recitation room of not so long ago is now recognized as unequal to modern demands. Spartan manners have gone the way of two-dollar board and morning chapel by candle light; the money outlay of the college for each student received has greatly increased, and not all of the difference goes for laboratories and specialized teaching.

The result has been just the same at Yale as at other colleges; her financial needs have been far in excess of her means, and has made the question of increasing the endowment an urgent one. President Eliot is reported to have said that Yale was doing more with less money than any other university in the country. With all the additions which recent years have brought to Yale's funds and equipment, her resources are still unequal to the demands on them.

The great increase in the size of classes during the last 15 years is only part of a general movement affecting other universities and colleges as well, and due to the widening of what may be called the college *clientèle*. It is now the proper thing for a young man whose parents are in easy circumstances to go to college, quite irrespective of the possession of scholarly tastes or an intention to enter one of the learned professions. The advantage which he seeks is primarily social, not scholastic. "A large part of the education which is obtained by the students of the universities," said President Hadley, recently, "is that which they themselves give to one another. This is true to a large degree in matters of intellect. It is true to an overwhelming degree in matters of sentiment and public spirit."

The increase in the number of students in the university, and the increase in the material resources of the university, have been, to the outsider; the most impressive changes in the evolution of the modern university from the old college. But in reality the change from the old curriculum of required studies to the elective system is far more epoch-making. Any one who will read the course of study printed in the Yale catalogue for 1883–1884 will probably rub his eyes in astonishment. It seems hardly to belong to the present century. All seniors were required to take a course in moral philosophy, the text-books for which are given as Butler's "Sermons" and Hopkins' "Law of Love." The study of natural theology and evidences of Christianity was also required. Of mental philosophy a staggering dose was administered. A good deal of natural science was included in the course, but the method of teaching was, as a rule, severely mathematical. In the field of science, freedom of teaching was not always absolute.

Yale University

It is now possible for the student to know something of everything and everything of something — if he wants to. When the change from the old system of required work was made it was hoped by some and feared by others that the result would be to make all students specialists. Both hope and fear have been disappointed. It is now plain that, whatever a free elective system does, it does not turn out, save in exceptional cases, either highly trained men or one-sidedly educated men. Indeed, it might almost be said that in New Haven at least the chief advantages of a wide range of electives has been to provide for exceptional cases. The average student follows a well-beaten path to general culture by way of a small number of popular courses. On the whole, it may be said that college education, after having been excessively scholastic, has been humanized again by the elective system.

But it must not be supposed that because the college educational system has modernized itself by giving up the old requirements it has arrived at a state of perfection. Never was there a greater opportunity for service in educational leadership at Yale than at the present time. There is a disposition nowadays to regard the duties of a college president as chiefly administrative and financial. Yale has done well not to fall into the mistake of putting a pure man of affairs at the head of a great university. For many questions press for settlement which a man unfamiliar with educational problems and methods would be unprepared to deal with. There is the question of the relation of the college course to professional and technical work, and of its relation to secondary education and the public school system. There are questions of university organization, and of teaching methods. And all are important. College education is now rich in culture, but is given too little power. Easy lecture courses are crowded and work is superficially done. The capacity for sharp, hard thinking is too little developed; students graduate miscellaneously informed, but immature and of flabby intellectual fiber. The college must educate in the world of modern thought, but it must prepare for the hard battle of strenuous life.

During President Hadley's administration he has shown himself a tactful and unifying, not a masterful and overbearing, leader. The task of the college president is now no easy one. There are always two parties in every faculty, and the official head is pretty sure to offend either one or the other, if he does not offend both. President Had-

ley is a conspicuous exception to the rule. He has won the support and confidence of everybody. Nor does this mean that the force of inertia has proved too great to be overcome. It is true that no radical or revolutionary changes have been made, but discussion is free and searching; the brakes are off and important questions are being worked out. It is immensely encouraging that the most conspicuous characteristic of the new administration is the moderation, farsightedness, and spirit of conciliation which have kept the whole mass in cohesion.

The first task incumbent on the new administration was to carry forward the plans which had already been outlined for the bicentennial celebration. The time had been considered a good one for calling on the alumni and friends of the university to send her into her third century better equipped for her work. Four million dollars were asked for altogether, one-third of which was to go into new buildings. Plans for a group of bicentennial memorial buildings were prepared, which include an Alumni hall and a University dining hall, both badly needed at Yale.

Of the entire sum asked for, $2,000,000 at least were wanted before October, 1901, when the celebration was to take place, and the rest by 1905 at latest. The president's report for the year ending June, 1900, showed that over $1,000,000 had been received or pledged. The sum asked for was no more than was required to put Yale abreast of her rivals, for she had long struggled against the serious handicap of inferior resources. To raise the money her appeal was made, not merely to very rich men, but to the mass of the alumni, and the number of subscribers to the fund was one of its most gratifying characteristics. From the time of his inauguration President Hadley has given himself to the work of strengthening the community of Yale men, graduates and undergraduates, and in this way is bringing a new power into the life of the institution.

The following passage from an address recently delivered by President Hadley strikes the note of character-building, which must always be the most important quality in the Yale conception of education:

"The course must be one for workers, and not for idlers. It must furnish hard tasks, not only for the effect of those tasks upon the individual, but still more for their effect in making the college a place for students who are not afraid of difficulties. Poor as was the curriculum of our colleges at the beginning of the century, it had this cardinal merit, that it admitted no loafing. The men who lived for four years in its atmosphere might obtain a narrow conception of learning, and go forth into the world poorly provided with practical equipment for the details of life; but they had obtained that habit of determination in the face of difficulties which does more than anything else to make a body of men powerful in their several spheres."



**Yalu,** the estuary of the most important of Korean rivers, variously called Yalu, Am-nok, or Ori-kang. This navigable river flows 300 miles S. W. to the bay of Korea, and its mouth was on Sept. 17, 1894, the scene of a great naval battle, in which a Chinese fleet of 12 warships, some of them powerful ironclads, and 16 other vessels, was defeated, with the loss of 4 vessels, by a Japanese force of 11 war vessels and 2 others.

**Yam,** the name given to the fleshy tubers of several species of *Dioscorea* extensively used for food in many tropical and subtropical countries, where they are also largely cultivated. The genus consists of upwards of 150 species of herbaceous perennials or undershrubs with twining stems, leaves mostly entire with strongly-marked veins, flowers inconspicuous, arranged in spikes, fruit with membraneous wings. There is much resemblance both in chemical composition and in the taste between the yam and the potato. The following are some of the best-known species; the two first being grown to the greatest extent. (1) The Uvi-yam of India and South Sea Islands (*D. alata*), also successfully cultivated in New Zealand and in the Southern United States. The tubers, of which there are many varieties, will under favorable circumstances attain a length of 8 feet and a weight of 100 pounds; they may be eaten baked or boiled. (2) *D. aculeata*, in which the stem is prickly, and unlike the above, does not require artificial support; it also ripens later than *D. alata*, has a sweet taste, and is spoken of as one of the finest esculent roots of the globe. It is found in India, Cochin-China, and South Sea Islands. (3) *D. hastifolia*, of Western Australia, found as far S. as 32°. The tubers are largely consumed by the aborigines for food, indeed it is the only plant on which

YAM.
a, flower; b, root.

they bestow any cultivation. (4) The hardy Chinese or Japan yam (*D. Japonica* or *D. batatas*), which has been introduced into Algeria, Southern France, and Australia, where it is reported to be of easy cultivation and to yield a prolific crop. (5) The Tivoli yam (*D. nummularia*), a high-climbing prickly species; the roots are cylindrical, and their taste is "exceedingly good." (6) *D. pentaphylla*, a good yam; the flowers of which are used as greens. (7) *D. purpurea*, Pondicherry potato, considered in Bengal the next best yam to *D. alata*. (8) The root of it yields *D. sativa* of Southern Asia, etc., which requires soaking before boiling; about 24 per cent. of starch. (9) *D. trifida*, cultivated in Central America. (10) *D. villosa*, called wild yam or colic root, said to be a specific for bilious colic, and also used as an anti-spasmodic.

**Yana,** or **Yan,** a river of Eastern Siberia. It rises in the Verkhoyansk Mountains; flows generally N.; and enters Arctic Ocean by seven large and many small mouths. Ust'-Yansk stands near the head of its delta. Length, 750 miles.

**Yambo,** or **Yanbo** (from its situation on the Red Sea coast also called YAMBO-EL-BAHR), a town of the province of Hedjas, Arabia, and the harbor of Medina, which lies 131 miles to the E. It consists of a long row of white houses built of limestone and coralline, standing on the edge of an arid plain. It has considerable imports and transit trade between Suez, Jidda, and Medina. Marking the end of the third quarter of the caravan journey from Cairo to Mecca, the town bears the title "Gate of the Holy City."

**Yancey, William Lowndes,** an American statesman; born in Ogeechee Shoals, Ga., Aug. 10, 1814; went to Alabama in his youth, and there studied law and began to practise in Montgomery. For a while he was engaged in journalism, and afterward served in both branches of the Alabama legislature. He was a member of Congress in 1844–1847, and while there exerted a strong influence as a leader of the Pro-slavery party in the South. As early as 1858 he advised the organization of committees of safety all over the cotton-growing States. He reported the Alabama ordinance of secession to the convention in Montgomery, which was adopted in January, 1861. In February following he was appointed a Confederate commissioner to the governments of Europe to obtain the recognition of the Confederate States. He entered the Confederate Congress early in 1862, and served till his death, near Montgomery, Ala., July 28, 1863.

**Yang-Ching.** See CANTON.

**Yangtze-Kiang,** the chief river of Asia; popularly known as the "Girdle of China"; uniting all the central provinces of that country. It lies between Tibet and Kokonor on the W. and the Pacific Ocean on the E., and, including its many windings, has an estimated length of 3,200 miles. Its source is found in the elevated region of Central Asia, and it flows first S. through a level country and then S. E. through the province of Yun-nan, and finally N. by E. with several turns to the S. If its many tributaries, their fertile valleys, and the vast population they support, be considered, the Yangtze-Kiang is the greatest river in the world.

**Yankee,** the popular name for the citizens of New England, but applied by foreigners to all the inhabitants of the United States. During the American Revolution it was applied to all the insurgents, and during the Civil War it was the term commonly applied by the Confederate soldiers to the Federals. The word is of doubtful origin. Some authorities consider that it arose from the first effort of the Indians "to imitate the sound of the national name of the English, which they pronounced Yengees." According to Dr. W. Gordon it was a favorite cant word in Cambridge, Mass., as early as 1713, and meant "excellent," as a "yankee" good horse, "yankee" good rider, etc. He supposes that it was adopted by the students there as a by-word, and, being carried by them from the college, obtained currency in the New England colonies, till at length it was taken up in other parts of the country, and applied to New Englanders generally as a term of slight reproach. As a drink, a yankee is a glass of whisky sweetened with molasses.

**Yankee Doodle,** the name given to a famous tune, now regarded as one of the national airs of the United States. Very many accounts have been given of its origin; some have professed to trace it to the time of the English Civil War, and have asserted that "Nankee Doodle" was a nickname for Cromwell, and that the rhyme

> "Nankee Doodle came to town, on a little pony,
> He stuck a feather in his cap, and called him macaroni"

referred to his entry into Oxford. The term "macaroni" sufficiently confutes the theory, for the Macaroni Club did not come into existence till the middle of the 18th century. In all probability the tune is of English origin, and not more than 150 years old. The first mention of it in print is said to occur in the Boston "Journal of the Times" for September, 1768:

> "Those passing in boats observed great rejoicings, and that the Yankee Doodle song was the capital piece in the band of music."

The words were probably composed by Dr. Schuckburg, who served under General Amherst, in the French and Indian war of 1755, and were intended to ridicule the Continental militia, the original title being "The Yankee's Return from Camp."

**Yankee Gang,** an arrangement in a sawmill adapted for logs of 21 inches diameter and under. It consists of two sets of gang saws, having parallel ways in the immediate vicinity of each other. One is the slabbing gang, and reduces the log to a balk and slab boards. The balk is then shifted to the stock gang, which rips it into lumber.

**Yankton,** a city and county-seat of Yankton co., S. D.; on the Missouri river, and on the Great Northern, the Chicago, Milwaukee,, and St. Paul, and the Chicago and Northwestern railroads; 61 miles N. W. of Sioux City, Ia. Here are Yankton College (Cong.), a high school, the State Hospital for the Insane, waterworks, electric lights, National, State, and savings banks, and daily, weekly, and monthly periodicals. It has an extensive general trade, and is the supply depot for the Indian agencies and military stations along the Upper Missouri. There are planing mills, large Portland cement works, flour mills, foundry, woolen mill, breweries, pork packing establishment, etc., and an assessed property valuation of nearly $1,500,000. Pop. (1890) 3,670; (1900) 4,125; (1910) 3,787.

**Yankton College,** a coeducational institution in Yankton, S. D.; founded in 1881 under the auspices of the Congregational Church; has productive funds exceeding $200,000; grounds and buildings valued at over $160,000; scientific apparatus, etc., $20,000; volumes in the library, about 7,000; average number of faculty, 24; average student attendance, 340; graduates, over 240.

**Yantic,** a river in Eastern Connecticut. It unites with the Shetucket and Quinnebaug rivers about 3 miles S. of Norwich to form the Thames river. It has a swift current and affords excellent water power, which is extensively used by the mills and factories along its banks.

**Yantic, The,** a single-screw, wooden cruiser, belonging to the United States navy; displacement, 900 tons; length, 179 feet 6 inches; breadth, 30 feet; horse power, 310; main battery, two 9-inch smooth-bore guns, one 8-inch muzzle-loading rifle and one 60-pounder rifle; secondary battery, one 12-pounder rapid-fire gun, one 3-pounder breech-loading howitzer and one Gatling; cost, $206,262.93; speed 8.3 knots. The keel of this old navy vessel was laid in 1862.

**Yapock,** the *Cheironectes variegatus* (or *palmatus*), from Guiana and Brazil. It is rather larger than a common rat, with large, naked ears, and a long, nearly naked, tail; fur brown above, with three transverse bright gray bands, interrupted in the middle, white below. Its habits closely resemble those of the otter, and it feeds on crustaceous and other aquatic animals.

**Yaquina Indians.** See YAKIMA.

**Yaquis** (yä′kēz), the Indians who inhabit the S. part of the State of Sonora, Mexico, in the district of Guaymas. In the time of Cortez they numbered 300,000; but are now reduced to about 15,000, of whom not more than 5,000 are able-bodied men. The Yaquis have always been at war with the Spaniards and Mexicans, and while often defeated have never been conquered. They revolted against Spain in 1735 and in 1825, and against the Mexicans in 1832, each time being overcome. In 1841 they made another attempt and for years held the government at bay. Order was restored by a compromise. War broke out again, however, and from 1848 till 1897, when a treaty was concluded at Ortiz, scarcely a year passed without a conflict between the Mexican troops and the Indians. In the summer of 1899, the Yaquis again broke out and a fierce struggle ensued. They were well armed with Winchester rifles and fought desperately; but gained no permanent success. The Yaquis, according to those who know them best, are much superior in intelligence to other Indians. They are industrious, and during the building of the Southern Pacific railroad worked faithfully. They saved the money so earned and invested it in rifles and ammunition. They are a pastoral people, but in a rude way are somewhat skilled in the arts. They are ruled by their own laws, follow their own customs, and are strongly attached to their ancestral pagan faith. They are naturally hospitable, kind to their families and very brave.

**Yard,** in ordinary language, the British and American standard of measure, being equal to 3 feet or 36 inches. As a cloth measure the yard is divided into four quarters = 16 nails. A square yard contains 9 square feet, and a cubic yard 27 cubic feet. A yard = 91.4382 centimeters, a square yard = 8,361.13 square centimeters, and a cubic yard = 764,535 cubic centimeters.

As a nautical term, a spar slung from a mast and serving to extend a sail. Yards are either square, lateen, or lug sail. Yards for square sails are suspended across the mast at right angles, and are of a cylindrical form, tapering from the middle, which is termed the slings, toward the extremities, which are called the yard arms.

**Yare,** a river of England, which, rising about the middle of Norfolk, flows E. past Norwich, and after receiving the Waveney

widens into the estuary of Breydon-water, is joined by the Bure, and enters the German Ocean 2½ miles below Great Yarmouth, after a course of about 30 miles.

**Yarkund,** or **Yarkand,** the chief town of the province of the same name in Eastern Turkestan; 140 miles S. E. of Kashgar. It is a great emporium of trade between China and the W., but it has been repeatedly devastated by the internecine wars which are chronic in Central Asia. The bulk of the inhabitants are Mohammedans of the Turki race; and in 1866 it was captured from the Chinese by Yakub Beg, who in 1874, entered into a commercial treaty with the British in India, and caravans of traders annually pass to and fro through the valley of Kashmir. The exports are chiefly shawl wool, raw silk, gold, and borax; the imports are piece goods, metal wares, tea, and indigo. In 1876 an English company sent its goods direct to Yarkund under European conduct, and Yarkund merchants annually go down to the Punjab. The soil of the province, which is watered by the Yarkund river, a tributary of the Tarim Kul, which flows E. into the lake called Lob Nor, is fertile; the crops are wheat, rice, barley, millets, fruits, and mulberry; and there are large herds of sheep, goats, cattle, and horses.

**Yarmouth,** or, as it is more strictly called, GREAT YARMOUTH, an English seaport, important fishing station, watering place, and municipal and parliamentary borough, in the county of Norfolk, 20 miles E. of Norwich; on a long and narrow tongue of land running from N. to S. between the German Ocean and the estuary of the Yare. The town is connected by a bridge with Little Yarmouth, or South Town, in Suffolk. Along the sea frontage stretches a promenade and carriage drive for three miles, with two piers. Parallel with the N. and S. quays, extending for nearly a mile and a quarter, are the principal streets, crossed by numerous narrow lanes called "rows." The parish church of St. Nicholas, founded in 1101, and of late years completely restored, is one of the largest in the kingdom. Yarmouth has a naval lunatic asylum, the only one in Great Britain. It is the great seat of the English herring and mackerel fishery, and also furnishes large quantities of white fish. The curing of herring as "Yarmouth bloaters" is an important industry. The coast is dangerous, but Yarmouth Roads between the shore and a range of sandbanks, offers a safe anchorage. Pop. (1901) 51,316.

**Yarmouth,** a town in Barnstable co., Mass.; on the New York, New Haven, and Hartford railroad; 75 miles S. E. of Boston, extending across the peninsula from Cape Cod Bay to Nantucket Sound. It embraces the villages of Yarmouth, South Yarmouth, West Yarmouth, and Yarmouthport, and Yarmouth Farms. There are numerous churches, a high school, district schools, public library, a National bank, with a capital of $350,000, daily and weekly newspapers, and an assessed property valuation of $1,800,000. The chief industries of the town are manufacturing, cranberry culture, agriculture, and shipping. Pop. (1890) 1,760; (1900) 1,682.

**Yarmouth,** a town in Cumberland co., Me.; on Casco Bay, Royals river, and on the Grand Trunk railway; 11 miles N. E. of Portland; comprising the villages of Yarmouth, North Yarmouth, Yarmouthville, and Cousen's Island. It has several churches, public schools, library, high school, the North Yarmouth Academy, granite quarries, foundries, cotton and paper mills. Pop. (1890) 2,098; (1900) 2,274.

**Yarmouth,** a town and port of entry of Yarmouth co., Nova Scotia; on the Bay of Fundy, the Atlantic Ocean, and the Dominion Atlantic railroad; 90 miles S. of St. John, N. B. The town has extensive fishing, shipping, and manufacturing interests, Yarmouth Seminary, schools, daily and weekly newspapers, electric lights, and street railways. Pop. (1891) 6,089; (1901) 6,430.

**Yarn,** any textile fiber prepared for weaving into cloth. Cotton yarn is numbered according to the number of hanks contained in a pound of 7,000 grains. Each hank, or skein, measures 840 yards. Worsted yarn has 560 yards to the skein; woolen yarn has 1,600 yards to the skein or run. Linen yarn is wound upon reels, and made up into leas, hanks, and bundles. Flax and jute yarn is numbered according to the number of leas of 300 yards per pound.

**Yarn Printer,** a machine for printing warps previous to weaving. This plan is adopted with some kinds of cheap goods to make stripes across the fabric, as with common carpets. A cheap kind of figured tapestry carpet is also made by printing in the patterns so as to come right when the warp is raised up in loops upon the face of the goods.

**Yaroslav,** or **Jaroslav,** a province of European Russia; bounded by the provinces of Novgorod, Vologda, Kostroma, Vladimil and Tver. The surface is level and well watered by the Volga and its tributaries, the Mologa and Sheksma. The W. portion of the province has numerous ponds and marshes, the largest being Lake Nero, near Rostov, from which the Weska flows. The Volga is connected with the Neva by two canals through which considerable commerce is carried on. Market gardening, timber cutting, mining, and manufacturing

are the chief occupations. There are extensive linen and cotton mills, and factories for the manufacture of chemicals, machinery, metal ware, flour, tobacco, and spirits, making Yaroslav one of the principal manufacturing provinces of Russia. Considerable commerce is carried on by the two railway lines, the Rybinsk-St. Petersburg and the Yaroslav-Moscow-Vologda. Area, 13,751 square miles; pop. (1909) 1,198,100.

**Yaroslav,** a city and capital of the province of Yaroslav, Russia; at the confluence of the Kotorost and Volga rivers; 173 miles N. E. of Moscow. It is the seat of the provincial government and of an archbishop. The city is largely engaged in manufacturing and commerce, the right bank of the Volga being lined for 2 miles with quays. There are numerous cotton and linen mills, silk factories, and bell foundries. The village of Velikoje Selo, included in the city, is the center of the linen manufacture of Russia, and has an annual output valued at $3,000,000. The city is the seat of Uspenskij Cathedral, begun in 1215, and has numerous other very old churches, several monasteries, schools, gymnasia, a theological seminary, and a lyceum with a law faculty. The left bank of the Volga is the suburban and residential portion of the city and contains many beautiful dwellings. Pop. (1909) 71,616.

**Yarra-Yarra,** the Australian river on which Melbourne, Victoria, is situated; length about 100 miles. On account of falls it is not navigable above Melbourne. See MELBOURNE.

**Yarrell, William,** an English naturalist; born in London, England, in June, 1784. He contributed frequently to the "Transactions" of the Linnæan Society, of which he became a fellow, and to natural history periodicals. His two works, the "History of British Fishes" (1836, etc.) and the "History of British Birds" (1843, etc.), are standard authorities. He died Sept. 6, 1856.

**Yarrow,** a name given to a pungent plant, *Achillæa millefolium*, also known as milfoil.

**Yarrow,** a parish in Selkirkshire, Scotland; chiefly pastoral; celebrated for its poetical and historical associations. The Yarrow river, famous in song, issues from the foot of St. Mary's Loch, and flowing 14½ miles E. falls into the Ettrick, 2 miles S. W. of Selkirk.

**Yarrow, Harry Crecy,** an American physician; born in Philadelphia, Pa., Nov. 19, 1840; was graduated at the Medical Department of the University of Pennsylvania in 1861; served through the Civil War as surgeon of the 5th Pennsylvania Cavalry; was surgeon and naturalist in the expedition to explore the territory W. of the 100th meridian; and acting assistant surgeon of the United States army for 30 years. He was author of "Introduction to the Study of Mortuary Customs Among North American Indians"; etc.

**Yarwhelp,** in ornithology, an old East Anglian name for *Limosa ægocephala,* the black-tailed godwit, which was also formerly called the shrieker or barker, from its loud cry. Professor Newton is of opinion that the old name, "Yarwhelp," still survives in "Whelp"-moor, near Brandon, Suffolk.

**Yataghan** (yat'a-gan), a sort of dagger-like saber with double-curved blade, about two feet long, the handle without a cross-guard, much worn in Mohammedan countries.

**Yates, Edmund Hodgson,** an English journalist and novelist; born in Edinburgh, Scotland, July 3, 1831; the son of the actor Frederick Henry Yates (1797–1842), who from 1825 was manager of the Adelphi Theater. He was educated at Highgate and Düsseldorf, and from 1847 till 1872 had a position in the postoffice, being for 10 years chief of the missing letter department. He lectured in the United States in 1872–1873; was special correspondent at Vienna, St. Petersburg, etc., of the New York "Herald" in 1873–1875; and London correspondent of the New York "Tribune" for a number of years. He wrote the following novels: "For Better, for Worse" (1863); "Broken to Harness" (1864); "Running the Gauntlet" (1865); "Kissing the Rod" (1886); "The Black Sheep" (1867); "Wrecked in Port" (1869); "Castaway" (1872); "A Waiting, etc.; Race" (1872); and "Recollections and Experiences" (1885). He was editor of "Temple Bar," "Tinsley's," and other periodicals, and in 1874 founded, with Grenville Murray, a very successful "society" weekly, "The World," which, for a libel on Lord Lonsdale, involved him in 1884 in two months' imprisonment. He died May 20, 1894.

**Yates, Lorenzo Gorden,** an American naturalist; born in England, Jan. 8, 1837; came to the United States in 1853; taught in Wisconsin; and later studied medicine and dentistry; served in the geological survey of California under Prof. J. D. Whitney; had charge of the scientific department of the Frœbel Institute, Los Angeles, Cal. He was a member of numerous scientific societies, and author of "California Digest of Masonic Law" (1867); "Charm Stones" (1886); "The Ferns of Ceylon" (1887); "Notes on Hawaiian Ferns" (1887); "The Channel Islands" (1890); "The Mollusca of Santa Barbara County and New Shells from the Santa Barbara Channel" (1890); "All Known Ferns"; "Aboriginal Weapons of California" (1900); etc.

**Yates, Richard,** an American lawyer; born in Warsaw, Ky., Jan. 18, 1818; was graduated at Illinois College, Jacksonville, in 1838; practised law a number of years; was elected to the legislature in 1842; and sent to Congress in 1850. In 1860 he was elected governor of Illinois. He was strongly opposed to slavery, and an ardent supporter of the government during the Civil War, taking an active part in the organization of volunteer regiments. He was United States Senator in 1865–1871, and afterward United States railroad commissioner. He died in St. Louis, Mo., Nov. 27, 1873.

**Yavary.** See JAVARY.

**Yawl,** a small ship's boat, usually rowed by four or six oars; a jolly boat; also a sailing boat similar to a cutter, but having a small sail at the stern.

**Yawning,** an involuntary opening of the mouth, generally produced by weariness, tedium, or an inclination to sleep, sometimes by hunger, etc. When yawning is troublesome, long, deep respiration, or drawing in the air at long intervals, relieves it.

**Yaws,** or **Framboesia,** in medical practice, that which is generally considered an acute specific disease; occurs in Guinea, America, Africa, and the West Indies, particularly in Jamaica, and Dominica. Yaws, called also mycosis (fungus) and piaro, is almost entirely confined to the African races, and was taken to the West Indies by Negro slaves. A report on this disease from the pen of Dr. Gavin Milroy was published by the British Colonial Office; and Drs. Fox and Farquhar have published, under the sanction of the Secretary of State for India, an account of it in their work "On Certain Endemic Skin Diseases of India," the first satisfactory description of yaws, which has been made public. It has been very fully investigated by Dr. Imray Z. Dominica, and Dr. Bowerbank of Jamaica. Dr. Imray says: "If yaws are observed as they first make their appearance on the surface, one or more minute whitish or yellowish points or spots will be perceived, not larger than a pin's head. These yellow spots are seen very distinctly on the dark skin of the negro. Gradually the spots enlarge, and begin to project from the surface, retaining for the most part their circular form, and have much the appearance of small globules of yellow pus, and unless carefully examined might be so mistaken. The skin remains unbroken till the yaws attain perhaps the size of a small pea, but the cuticle may give way at any time. Then a yellowish, spongy surface presents itself, from which a thin fetid fluid oozes, and this spongy body continues to enlarge, and projects considerably from the surface. Yaws are usually circular in form, and may be seen in the same patient of all sizes, from scarcely more than a pin's head to a patch of more than one or two inches in diameter, and in every stage of their progress. Generally they are separate, but sometimes in groups close together, small and great. Again they are met with of an oval form, but more rarely. In other cases they are irregular in shape, and so close together as to make one mass. It frequently happens that one of these tubercles assumes very large proportions, one or two inches in diameter, or even more, projecting from the skin like the other yaws, and covered with yellow scabs, receiving in English the name of mother yaws, and in the French patois, *maman pian.* All the other yaws may entirely disappear, and the mother yaws only remain; and, if neglected, it will degenerate into an intractable ulcer, eating its way into the tissues, and causing extreme and irreparable destruction of the parts around, and be often accompanied by great constitutional irritation and extensive emaciation."

The usual duration of yaws is from two to four months, under appropriate treatment; or about 13 months in severe cases; but it may last for years with periods of quiescence. Yaws is a communicable disease, and Dr. Imray speaks positively of its being conveyed from person to person by contact, or the absorption of the poison through some abraded surface, though it is not infectious. The poison may be carried from individuals by flies. The period of incubation is thought to be from 3 to 10 weeks.

Regarding the treatment, Dr. Imray says: "In the early stage it is customary first to wash the patient, then to encourage the full development of the eruption by the exhibition of sulphur and supertartrate of potash for six or eight days. In the next place, mercury is to be administered in conjunction with decoction of sarsa, or sassafras, or mezereum, in the form of *tisanes,* to which great virtues are attributed. The mercury is to be dropped directly signs of its action on the gums show themselves. Tonics should be conjoined with mercurials in the case of weak persons. Occasionally aperients are also needed. The diet should be good and unstimulating. As regards local applications, Dr. Imray advises a carbolic-acid solution, or weak nitrate of mercury ointment. The natives apply the boiled and beaten-up leaves of the physic nut, *Fatropha curcos*; the juice of the sour orange, the *Fanipha manihot;* or the flowers of sulphur dusted over the part. Mercury, according to Dr. Bowerbank, is the active ingredient in all the yaws specifics

used in Jamaica. Iodide of potassium is also efficacious, especially if the disease attacks the mucous membranes.

**Yazoo City,** a city and county-seat of Yazoo co., Miss.; on the Yazoo river and on the Illinois Central railroad; 35 miles N. W. of Jackson. It is in an extensive corn and cotton-growing section, and ships about 70,000 bales of cotton each year. Here are waterworks, a sewer system, electric lights, National and other banks, and a number of weekly newspapers. It has large lumber interests, an extensive cotton seed oil plant, etc. Pop. (1890) 3,286; (1900) 4,944.

**Yazoo River** (from an Indian word meaning "river of death"), a tributary of the Mississippi. It lies throughout its whole extent in the State of Mississippi. The Yazoo proper, formed by the confluence of the Tallahatchie and the Yallobusha, commences below Polckville, and after a deep, slow, tortuous S. W. course of 290 miles enters the Mississippi 12 miles above Vicksburg. It traverses a fertile country, and is throughout navigable. The waters of the Tallahatchie are partly received from the Mississippi itself, and, but for a slight obstruction, steamers from the Missisippi might thus enter the Yazoo at its extreme source, and after traversing its whole length reënter the Mississippi at Vicksburg.

**Yazikov** (yä-zē-kof'), called the Russian Anacreon, a Russian lyric poet; born in Simbirsk, Russia, in 1805. His earlier verse was notable for sweetness and melody; his later work was more serious in character. He died in 1846.

**Year,** a unit of time, marked by the revolution of the earth in its orbit. The year is either astronomical or civil. The former is determined by astronomical observation, and is of different lengths, according to the point of the heavens to which the revolution is referred. When the earth's motion is referred to a fixed point in the heavens, as a fixed star, the time of revolution is the time which elapses from the moment when the star, the sun, and the earth are in a straight line, till they again occupy the same position; this is called a sidereal year. If the revolution is referred to one of the equinoctial points, the year is somewhat shorter than the sidereal year, on account of the precession of the equinoxes, that is, the retrogression of the equinoctial points along the ecliptic. This is called the equinoctial, tropical, or solar year. The length of the sidereal year is 365.2563612 mean solar days, or 365 days, 6 hours, 9 minutes, 9.6 seconds. The length of the solar or equinoctial year is 365.2422414 mean solar days, or 365 days, 5 hours, 48 minutes, 49.7 seconds. The difference between these two years is 19 minutes 19.2 seconds mean solar time, that being the time required for the earth to advance in its orbit a distance of 50.1″ of arc. The civil year is the year of the calendar. It contains a whole number of days, beginning always at midnight of some day. According to the present system, or according to the Gregorian calendar, every year the number of which is not divisible by 4, also every year which is divisible by 100, and not by 400, is a common year, and contains 365 days. All other years are called leap years, and contain 366. The ecclesiastical year is from Advent to Advent. A lunar year is a period consisting of 12 lunar months. The astronomical lunar year consists of 12 lunar synodical months, or 354 days, 8 hours, 48 minutes, 36 seconds. The common lunar year consists of 12 lunar months or 354 days. The Embolismic or Intercalary lunar year, consists of 13 lunar civil months, and contains 384 days. Also the period in which any planet completes a revolution; as, the year of Jupiter or of Saturn.

Anomalistic Year. See Anomaly.

Year and a day, in law, the lapse of a year with one day added to it; a period which determines a right or works prescription in many cases. Year day and waste, in law, part of the sovereign's prerogative in England, whereby he was entitled to the profits for a year and a day of the tenements of persons attainted of petty treason or felony, together with the right of wasting the said tenements; afterward restoring it to the lord of the fee. It was abolished by the Felony Act, 1870. Year of grace, any year of the Christian era. Year to year tenancy, in law, a tenancy taken at first for a ear, but which continues for a second year unless one of the parties on the expiration of the first six months intimates to the other his intention not to renew it. The same rule will obtain year after year till the six months notice of non-renewal is given.

**Year Book,** originally a copy of reports in law cases, issued annually by the scribes or clerks of the courts, from the time of Edward II. to that of Henry VIII. The name is now given to books sent out at the beginning of each year by cities, States, or countries, or by newspaper and other publishers, and which include, besides an almanac, the agricultural, political, scientific, and educational statistics and chief items of interest of the preceding year.

**Yeast,** the yellowish substance, having an acid reaction, produced during the vinous fermentation of saccharine fluids, rising to the surface, when the temperature of the fluid is high, in the form of a frothy, flocculent, viscid matter (surface yeast), and falling to the bottom (sediment yeast) when

the temperature is low. The ordinary yeast of beer consists of an immense number of minute cells, which constitute a plant called the yeast plant, which multiplies by budding off other cells, or sometimes by spores. Little is known regarding the genesis of the yeast plant. Pasteur's researches seem to show that the yeast which forms in grape juice is derived chiefly from certain germs abounding about harvest time on the grapes, and diffused throughout the atmosphere of breweries and wine cellars, etc. Yeast is not only essential to the production of wine from grape and other fruit juices, and to the manufacture of beer, but it is also an agent in producing the fermentation whereby bread is rendered light, porous, and spongy, and in Great Britain at least has superseded leaven (see FERMENTATION). German yeast is prepared in various ways from common yeast collected, drained, and pressed till nearly dry. It can be so kept for several months, and is much used by bakers. Patent yeast is yeast collected from a wort of malt and hop, and treated similarly to German yeast. Artificial yeast is a dough of flour and a small quantity of common yeast made into small cakes and dried. Kept free from moisture, it long retains its fermenting property.

**Yeates, William Smith,** an American geologist; born in Murfreesboro, N. C., Dec. 15, 1856; was graduated at Emory and Henry College, Va., in 1878; served on the United States Fish Commission in 1879-1881; was acting curator and assistant curator of the United States National Museum in 1881-1893; professor of mineralogy at the Corcoran Scientific School in 1884-1893, and of geology in 1890-1893; and became State Geologist of Georgia in the latter year. He died in 1908.

**Yeats. S. Levett.** See LEVETT-YEATS, SIDNEY KILMER.

**Yeats, William Butler,** an Irish poet, dramatist, and orator; born in Dublin, Ireland, June 13, 1865. Beginning his career as an art student, he gave up art for literature when he was twenty-one. He was one of the leaders of the Irish literary revival, which began toward the end of the nineteenth century; one of the chief organizers of the Irish Literary Theater, and president of the Irish National Theater Society, which succeeded it. He has written, in poetry, "The Wanderings of Oisin" (1889); "The Countess Kathleen" (1892); "The Land of Heart's Desire" (1894), a play; "Poems" (1895); "The Wind among the Reeds" (1899); "The Shadowy Waters" (1900); "Poems" (1901); and "In the Seven Woods" (1903), poems chiefly of the Irish heroic age. His prose works are: "John Sherman and Dhoya" (1891); "The Celtic Twilight" (1893); "The Secret Rose" (1897); "Kathleen-ni-Houlihan" (1901), a play; "Plays for an Irish Theater," 2 vols. (1903); "Ideas of Good and Evil" (1903), essays; "The Hour Glass and Other Plays" (1904). He has edited "The Works of William Blake" (1893), "A Book of Irish Verse" (1895 and 1900), and "Samhain" (1901-02), the organ of the Irish National Theater Society. He came to the United States in 1903-04, visiting the principal cities, lecturing with much success on the Irish literary renascence, and reading selections from his works, in which he proved himself an orator of high gifts and strong originality. Although a poet and a dreamer he has a profound knowledge of the social and political economics of his native country.

**Yedo.** See TOKYO.

**Yell,** the second largest of the Shetland Islands; separated from the mainland by Yell Sound; 25 miles N. of Lerwick. It is about 17½ miles in length, and from half a mile to 6 miles in breadth. The surface is chiefly moorland, and fishing is the leading employment.

**Yellow,** one of the three primary colors; a bright golden color, the type of which may be found in the field buttercup, which is a pure yellow. Mixed with blue, yellow yields green, and with red it produces orange. All our yellow pigments are alloyed with blue or red. Gamboge is a tolerably pure yellow pigment, but is tinged with blue; then comes gold ocher tinged with red; next yellow ocher and Naples yellow. In France the doors of traitors were daubed with yellow, and in some countries the law formerly ordained that Jews should be clothed in yellow because they had betrayed our Lord. Judas is represented clothed in yellow. In China yellow is the symbol of faith.

**Yellow Bird,** the *Chrysomitris tristis*, the American goldfinch, or thistle bird, generally distributed over North America; length about five inches; male bright gamboge-yellow, with black crown, wings, and tail; band across wings, inner margin of tail feathers and tail coverts white; female of duller plumage. Also, *Dendroica æstiva*, common throughout the United States. Length about five inches; head and lower parts bright yellow, rest of upper parts olive-yellow; back, breast, and sides streaked with brownish-red; two yellow bands on wings. Called also the yellow-poll warbler and summer yellow bird. The cow bird often deposits one of its parasitic eggs in the nest of the summer yellow bird, which being unable to eject the large strange egg, pecks a hole in it and buries it at the bottom of the nest. If by chance the cow bird visits the same nest a second time, the egg is again buried, and thus are formed the three-storied nests occasionally found by egg-hunters.

**Yellow Earth,** a mixture of limonite (hydrated protoxide of iron) with hydrated silicate of alumina, found in various countries. It is often used as a coarse yellow pigment, and sold under the name of Prussian red, English red, etc. It is stated by Bunsen to be a valuable antidote to the poison of arsenic.

**Yellow Fever,** an infectious continued fever, ushered in with languor, chilliness, and more or less severe lumbar pains and frontal headache, countenance flushed, eyes at first humid, then suffused, and ultimately ferretty, skin imparting a tingling heat to the touch, and, as the second stage advances, gradually acquiring a lemon or greenish-yellow tinge, mind usually disturbed with hallucinations, or more or less violent delirium, restless watchfulness, or, possibly, drowsiness even to extreme coma, epigastric uneasiness, spontaneous vomiting without effort, first of a clear glairy fluid, but subsequently with coffee-ground flocculi, or blood itself, often, toward the close, with irrepressible hiccough, and wild shrieking or melancholy wailing, tendency fatal, but the disease generally confers an immunity from subsequent attacks.

The first recorded outbreak of yellow fever occurred in the West Indies in 1647, and since that time it has been recurring at regular intervals in an epidemic form, and gradually extending its range; but it is endemic in certain localities, and notably so in the islands of St. Thomas and St. Domingo. Regarding its altitudinal and horizontal ranges Dr. Macdonald says: "It may be very well to assign an altitudinal limit of the spread of yellow fever, and, roughly speaking, this may be estimated at between 2,000 and 3,000 feet above the level of the sea, but the local conditions of every country seem to determine a range peculiar to itself. Thus the disease has been known at Newcastle, Jamaica, at an elevation of 4,000 feet, while in the valley of the Mississippi its highest recorded range is about 600 feet (admitting the fever of Gallipolis to be of the genuine type). Humboldt alludes to the farm of Encero, in Mexico, at an elevation of 3,243 feet, as the altitudinal limit of the black vomit. At St. Domingo the encampments of the French in 1792 and of the English in 1796 enjoyed an immunity from the disease, while it was spread far and wide among the troops in the low country. Though the West Indian islands, and the neighboring coasts of North and South America, may be looked on as the focal area of yellow fever, yet, taking the outlying points at which its occurrence in the epidemic form has been recorded, its geographical range must be regarded as very considerable indeed, *i. e.*, between lon. 97° W. and 2° E., and between lat. 48° N. and 35° S. At least for the space of a century and a half, up to the year 1850, the Amazon river, dividing the Brazils from Guiana, limited the extension of yellow fever S. of the line; and while the disease was raging at Rio and Bahia, at the close of that epoch, the Montevideans flattered themselves that they were without the geographical limits of the pestilence, till it fell to their turn to sustain its visitation several years later, when the illusion was dispelled. Similar facts may be adduced regarding the extension of the disease along the shores of the Pacific; so that, however well we may be acquainted with its present range, making all due allowance for temperature, we cannot tell what the future may bring forth. In this connection it may be mentioned that a temperature of at least 72° is assumed to be essential to the development of yellow fever, though cases exceptional to this rule may now and then happen."

The phenomena of yellow fever evidently result from the operation of some specific organic poison on the system through the blood, the poison being eliminated chiefly by the gastro-intestinal mucous membrane when both liver and kidney have been rendered ineffective in bringing about this result. There can be no doubt whatever that yellow fever is a communicable disease, though there is a difference of opinion as to whether it is contagious or infectious; as to whether the specific poison is generated within or without the human body. Hænisch says: "Yellow fever is most probably produced by a living miasm, which has hitherto entirely eluded microscopic demonstration, but the existence of which is argued from very many facts. These seeds of disease, as soon as they become in any way established in a human organism, set up in it that diseased process to which we are accustomed to give the name of yellow fever. They are not, however, reproduced in this diseased organism, they do not multiply in it, nor migrate from it to other men; yellow fever is not, then, in this sense, a contagious disease. But its seeds long retain their poisonous nature; they are, under certain circumstances, quite indestructible, and when placed in suitable external conditions are capable of kindling an epidemic even far away from their place of origin." This seems to be a commonly received opinion by physicians engaged in practice in districts where yellow fever is frequently epidemic. The surgeon-general of the United States Marine Hospital Service stated, in a circular issued in September, 1878, that "yellow fever patients have been treated in the marine hospitals at St. Louis, Cairo, Louisville, and Cincinnati without communicating the disease, simple precautions having been taken to disinfect the clothing and other effects immediately on receiving

Yellow Fever

the patients. It is a well-known fact that the unacclimatized attendants on yellow fever patients at the New York Quarantine Station do not contract the disease. Yellow fever is transported by things, and not by persons considered apart from clothing." The late Dr. Nott of Mobile, the late Dr. Warren Stone of New Orleans, and Professor Stillé of Pennsylvania, maintained the same doctrine; but the question still remains *sub judice*. The infectious nature of yellow fever is generally admitted by British physicians. Professor Stillé summed up a lecture (March, 1879) on yellow fever as follows: "(1) Yellow fever originates nowhere but in the West Indies. (2) Its morbid poison is conveyed elsewhere in ships and fomites. (3) Wherever conveyed, a high temperature is essential to its propagation. (4) A strict quarantine is always efficient in preventing its dissemination. (5) It is not contagious. (6) Its essential cause cannot be isolated or defined, but must be assumed to be a specific poison. (7) This poison in the system acts primarily in two ways, by disintegrating the blood and inflaming the stomach; and that, secondarily, it tends to impair the eliminating functions of the kidneys." Professor Stillé, however, admitted that yellow fever is highly infectious.

In December, 1878, a board of experts, consisting of 12 medical men and a sanitary engineer, with Surgeon-General Woodworth as president, was appointed by the Health Committees of the Senate and House of Representatives of the Congress of the United States to investigate the yellow fever epidemic, and they came to the following conclusions: (1) Yellow fever is a specific disease, due to a specific poison which has not been chemically or microscopically demonstrated, nor in any way made evident to the human senses; it is material and particulate, and endowed with the vital properties of growth and reproduction; the disease is not malarial, and malarial influences do not contribute toward its dissemination or mortality to any greater extent than to other epidemic diseases; a concurrence of local conditions seems to be necessary to the evolution of the disease, but what these are we have no positive knowledge. (2) Yellow fever is a disease of singular local attachments, often prevailing in a very small section of a city, with remarkable indifference to topographical and social surroundings; while atmospherie air is the usual medium by which it is conveyed, it has been in no instance established that the disease has been carried to any considerable distance by atmospheric currents, or by any modes or vehicles of conveyance other than those connected with human traffic and travel; the period of incubation varies from two to five days; the fever is unknown in Asia; the white race is most susceptible to its influence, and furnishes the highest ratio of deaths. (3) Yellow fever is a disease of warm climates and of warm seasons; it is destroyed easily by exposure to air, by frost and by chemical disinfectants, when they can be adequately used; and one attack confers immunity from a second. (4) The disease was unknown to the inhabitants of the Eastern Hemisphere till after the discovery of America by Columbus, and the islands of the West Indies are its home; it has never made its appearance on the great continent of Asia, nor in Australia, nor in any of the islands of the Pacific Ocean, nor on the Pacific coast of the American continent; and outside the West Indies the disease is an exotic. (5) The fever has invaded the United States in 88 different years, in 77 of which there is evidence of importation, and in 71 of these 77 the evidence points to the West Indies; that, as a rule, very nearly without exception, yellow fever has always appeared in some of our seaports before it has made its appearance anywhere in the interior of the country; the disease is not indigenous to the United States, and it travels by the lines of human intercourse, no instance of communication having occurred in shorter time than would have sufficed for a man to have made the same journey.

Regarding the treatment of yellow fever, it may be said that there is no known specific, and it is thus symptomatic; but whatever is to be done should be done quickly, and the earlier a clear diagnosis is formed the better. The fever commences abruptly, and is attended with severe headache, great irritability of the stomach, and vomiting, the vomited matter being first slimy and tasteless, but afterward black like coffee grounds. When the sixth day elapses without the occurrence of black vomit or suppression of urine, hopes of recovery may be entertained, but the mortality is usually one in three. On the first invasion of the disease the *pediluvium* may be employed, and warm drinks given to promote perspiration. The bowels, which are usually constipated, should be opened with a purgative; and, if the constipation continues, by enemata. Acetate of ammonia, nitrate of potash, nitrous ether, and the tincture of squills and hyoscyamus may be given, and lime juice for drink. The irritability of the stomach may be allayed by limewater in combination with milk; or chalk-mixture, as the vomiting frequently depends on the presence of free hydrochloric acid in the stomach. Creosote, hydrocyanic acid, chloroform, or chlorodyne may be used, and when procurable, ice may be swallowed. Morphia may be injected subcutaneously in the epigastric region. Chlorate

of potash and tannic acid have been recommended. The strength should be supported by giving, after short intervals, the essence of beef, and digestion will be aided by the administration of pepsine. Stimulants should also be given, champagne in particular when it can be procured. Hænisch suggests that transfusion of blood, after previous blood letting, might paralyze or modify the injurious operation of the yellow fever miasm. Surgeon-General Woodworth recommended those exposed to the infection to use small doses of quinine, chlorate of potash, and tincture of iron. "As the poison enters the system through the air passages, it has been suggested that the nasal passages be bathed frequently with a solution containing quinine, to be applied by means of a nasal spray."

**Yellow Hammer,** or **Yellow Bunting,** the *Emberiza citrinella,* a bird, widely distributed over Europe and North America.

THE YELLOW HAMMER.

Length about seven inches; general color bright, with patches of dark brown, richly-mottled brownish-yellow on back, with a warm ruddy tinge; primaries black, edged with yellow; chin, throat, and under part of body bright, pure yellow turning to dusky-brown on the flanks; tail slightly forked, and shorter than in the common bunting. The female is similarly marked, but less bright in hue. The yellow hammer frequents hedges and low trees; it nests on the ground, and the male assists in incubation. The song consists of few notes, but is sweet and pleasing.

**Yellow Hercules,** a plant, the *Xanthoxylon clava Herculis,* meaning the club or cudgel of Hercules. So called because in the West Indies the young prickly stems are often made into walking sticks.

**Yellow-horned Moth,** a European night moth, *Cymatophora flavicornis.* Fore wings pale, greenish-gray, with darker portions; hind wings grayish-brown. Expansion of wings, an inch and a half. The caterpillar feeds, in September, on the birch, rolling up the leaves to obtain shelter for itself.

**Yellow Jack,** a nickname for YELLOW FEVER (*q. v.*). Also the flag displayed from lazerettos, naval hospitals, and vessels in quarantine.

**Yellow Jacket,** a species of small wasp, marked with black and yellow stripes; its sting is very painful. Also a jacket worn in China as a token of royal favor.

**Yellow Lake,** various pigments of a bright color, not affected by an impure atmosphere, but rapidly altering under the influence of oxygen and light.

**Yellow-legged Clearwing,** a British hawk moth, the *Trochilium cynipiforme,* or *Sesia cynipiformis.* Fore wings transparent, with the costa and hind margin black; under margin and transverse central spot blue-black, tinged with orange; body black, with yellow rings and stripes; the expansion of wings about an inch. Caterpillar feeds under the bark of the oak. The perfect insect appears in June.

**Yellow Legs,** the *Gambetta flavipes,* a bird found in the Eastern States of North America. It is about 10½ inches long and measures 20 inches from tip to tip. It is of an ash color, with large spots of brownish-black, edged with an ashy white. It has a rather long bill of greenish-black, and yellow legs. It lives abong the grass and rushes on the edges of rivers or ponds, and feeds on shrimp, worms, and aquatic insects, both in salt and fresh water. When fat, it is very good eating.

**Yellow Medicine River,** a river rising in the N. part of Minnesota and emptying into the Minnesota river in Yellow Medicine county; about 100 miles long.

**Yellow Orpiment,** yellow arsenic or sulphuretted oxide of zinc, of a beautiful bright and pure yellow color, used as a pigment. In its native state it is used under the name of zarnic or zarnich, varying in color from warm yellow to greenish yellow. Orpiment, in all its varieties as a color, is subject to change and to be changed by all pigments containing oxygen; and if used must be employed alone.

**Yellow Pine,** a North American tree, the *Pinus mitis* or *variabilis.* The wood is universally employed in the countries where it grows for domestic purposes, and is also extensively exported to Great Britain and elsewhere. In Canada and Nova Scotia the name is given to *P. resinosa,* and it is also applied to *P. australis.*

**Yellow Rattle,** in botany, a name for the genus *Rhinanthus;* belongs to the order *Scrophulariaceæ,* or figworts, and is called rattle because the seeds when ripe rattle in the husky capsules. The typical species, the common yellow rattle (*R. cristagalli*), with its two sub-species, the greater and the lesser yellow rattles, is wild in Europe.

All the three, as their names imply, have yellow flowers.

**Yellow River,** a river of Georgia, rising in Gwinnett county, and flowing S.; it is one of the branches of the Ocmulgee.

**Yellow River,** a river in Wisconsin; rises near the E. boundary of Clark county, flows S. through Wood county, and enters the Wisconsin river in Juneau county, at Germantown.

**Yellow River** (Chinese Hwang-Hai), one of the principal rivers of China, known also as "China's Sorrow" on account of its frequent devastating floods. It rises in the plain of Odontala, S. of the Kuen-Lun Mountains, follows an exceedingly tortuous course for more than 3,000 miles, and empties into the Gulf of Pe-chi-li.

**Yellow Root,** in botany: (1) *Xanthorrhiza apiifolia.* Its long roots and rootstock are bright yellow, as are its leaves, bark, and pith. It grows in the Southern States of North America. The yellow root is intensely bitter, and is used as a tonic. The native Indians formerly employed it as a dye. (2) *Hydrastis canadensis.* This also has a yellow root, or rather an underground stem, and was formerly employed by the Indians in dyeing yellow. It likewise is tonic. The fruit is like that of the raspberry, but the plant belongs to the *Renunculaceæ.*

**Yellows,** a disease of cattle very similar to JAUNDICE (*q. v.*), and produced by congestion and inflammation of the liver. Overfeeding with rich and heating food, sudden changes in the weather, and excessive milking are the principal causes. The animal ceases to ruminate, is dull, languid, and hide-bound, and has an unhealthy coat of hair. The whites of the eyes and inside of the mouth become dirty yellow in color. The bowels may be costive, or there may be scouring, accompanied with a fetid odor. In cows the secretion of milk also quickly fails. The first remedy is change of diet to plain, sweet, nutritious food. The grooming should be of the best and the comfort of the animal in every way cared for. Give the following as a laxative and tonic: One-half ounce of sugar and of aloes, one ounce each of castile soap, scraped fine, and of powdered Peruvian bark, mix in a pint of water and give one of these doses every three or four days, as the animal may seem to need. This is for the disease as brought about by ordinary causes. If this does not give relief, and, if in addition to a yellow skin and a jaundiced eye, there is a loss of appetite, incessant thirst, hard and rapid pulse, and heaving of the flanks; if the ears are alternately hot and cold, and the urine turns to a transparent, red, yellow, or brown, give the following: Two ounces of laudanum, 20 drops of croton oil, and one pound of sulphate of magnesia, in a quart of linseed tea; hasten the action of the dose by mashes, or something of that kind, turn the animal out to grass, and repeat the dose if the bowels again become costive; and the evacuations are passed in hard, dark balls.

**Yellows,** a disease to which the peach, especially in the Middle States, has long been subject. So far there has been no remedy found except that of grubbing and burning the affected trees.

**Yellow Sea** (Chinese, Whang Hai), an arm of the Pacific Ocean; on the N. E. coast of China; length, about 620 miles; greatest breadth, about 400 miles. It is very shallow, and obtains its name from the lemon-yellow color of its water near the land, caused by mud suspended in the water from the inflow of the Hoang-ho and Yang-tse-kiang rivers.

**Yellowstone,** a river of the United States, which rises in the Rocky Mountains, about lat. 44° N. and lon. 110° W. After a course of about 25 miles it passes through the lake of the same name, and runs N. through the Yellowstone National Park. Soon after issuing from the lake the river makes at intervals a series of falls (the last being 300 feet high), and traverses cañons, one of which, the Great Cañon, is 30 miles in length, its steep sides being colored in bright hues and shaped in great variety of fantastic forms. Running in a N. E. direction the river ultimately joins the Missouri about lat. 48° N., after a course of about 1,100 miles. Steamers can ascend it for 300 miles to the mouth of the Big Horn, which is its largest affluent.

**Yellowstone Lake,** formerly called SUBLETTE'S LAKE, a beautiful lake in Wyoming, at the N. E. base of the Rocky Mountains; in the National Park of the Yellowstone, at an elevation of 7,788 feet above sea-level. Its greatest extent is about 20 miles, and its greatest depth 300 feet. Its outlet is the Yellowstone river, which issues from the N. end of the lake. The Upper Yellowstone river enters at the opposite side. This lake is surrounded on several sides by high mountains among which are Mount Sheridan and Mount Langford.

**Yellowstone National Park,** a remarkable region in the extreme N. W. corner of Wyoming; set apart by Congress for a National reservation in 1872. Its area was originally 3,575 square miles, to which Congress, in 1891, added a tract of nearly 2,000 square miles to the S. and E.— nearly all more than 6,000 feet above sea-level, and rising in the snow-covered mountains to 10,000 to 14,000 feet. Situated on the "Great Divide," its pine-clad mountains form the gathering ground for the headwaters of large rivers flowing away to the

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Atlantic and Pacific Oceans, and for the sake of the rainfall and the rivers its forests are carefully preserved.

The region is remarkable as well for its scenery as for its famous hot springs and geysers. There are three geyser basins located in the valley of the Fire Hole river, at an average altitude of 7,000 feet above the sea-level. They are the Upper, Middle, and Lower, and are from 10 to 15 miles apart, in their order. The Upper, or Great Geyser basin, is the most active. Here are located the great spouters, conspicuous among which are the Giant, Giantess, Bee Hive, Castle, Grand Cornet, Saw Mill, Lion and Cub, and last, but by no means least, Old Faithful. These are all appropriately named. For instance, the Giant and Giantess are so called because of the immense size of their craters and the force of their action; the Bee Hive and Castle because of the peculiar formation of their cones; the Saw Mill and Lion from the roaring noise they make when in a state of activity; and Old Faithful, because she discharges her chambers of steam and water at regular intervals of 64 minutes. The tourist can rely as absolutely on Old Faithful giving an exhibition every hour and four minutes as he can on the rise of the sun at the time specified in the almanac. The stated intervals of her activity have not varied in the memory of the oldest habitue of the park. Other geysers are variable in the time of their action. In fact all of the others seem to be subject to changes. The Bee Hive is becoming more active every season. She gives an exhibition from two to three times every 24 hours, with "no postponement on account of the weather." The Giant and Giantess and Castle can not always be counted on, but they are all worth watching, for they make a magnificent display when in action. The Giant averages an exhibition about every six days and the Giantess about every 11 days.

As the tourist lies rolled up in his robes at the dead hour of night in this romantic region, he may feel the earth tremble, hear the rushing of water and the hissing of steam, and, if he will look out of his tent, he may see near by, or in the dim distance, as the case may be, limned in shadowy outline against the star-lit sky, a column of water from 5 to 10 feet in circumference and from 200 to 300 feet in height, throwing off dense volumes of steam. This phenomena will continue for 10 or 15 minutes, and then all will be comparatively calm, with nothing to break the solemn stillness but the roar of the receding waters as they rush down the steaming crater back to the deep-seated chambers, from which, in due course of time, they will again be forced above the surface by another column of steam, generated at the source of heat. By the side of the main cone of the Giant Geyser is a small fissure, which performs the functions of an escape pipe to a monster boiler. When the chambers of the main crater become fully charged, short puffs of steam come hissing through this fissure, followed in a few minutes by a tremulous movement of the hollow formation under your feet, if you happen to be standing near the geyser, and a volume of steam forces its way through the orifice of the main crater with detonations, and an ominous stillness ensues for a second, which the tourist improves by beating a precipitate retreat from the brink. Finally the elements of disturbance seem to combine their forces for a final convulsive effort. Simultaneously with a stunning shock, caused by a pent-up volume of steam, a column of water, 10 feet in circumference, is precipitated high into the air, emitting a volume of steam so dense that it is difficult to define the outlines of what appears to be a massive pillar of Parian marble. A puff of wind wafts aside the shadowy substance, and the transcendent beauty of the column stands revealed in all of its grandeur. The drapery has been removed, and the Parian pillar stands out against the azure background of an autumn sky, illuminated by a dazzling sunlight. Then comes the transformation scene. This column is shattered by an invisible force into fragments, which descend like brilliants through the fierce blaze of the sun. The laws of gravity have asserted themselves, and the water, which went up in a volume, is falling in showers of spray. The delusion is dispelled. It was not a dream. The senses are no longer stupefied. The phenomena have ceased, and nothing now remains to be seen or heard but the flooded cone and the rushing of the receding water down the deep-throated geyser, and the ascent of wreaths of steam, which form fantastic shapes under atmospheric influences. The great volume of the discharge falls again to the crater, and the overflow finds its way into the Fire Hole river, whose swift current courses through the three basins, fed by a hundred geysers and a thousand boiling springs.

In the Middle Geyser basin there are no cone geysers, such as abound in the Upper basin. The great marvel of the Middle basin is called "Hell's Half-Acre." This is a steaming abyss on the bank of the Fire Hole, 25 or 30 feet in depth, in a limestone formation, which at irregular intervals of from four to five times per day, astonishes the natives by the intensity of its activity. A view of "Hell's Half-Acre" is indeed grand and awe-inspiring. But there is a view near by which should not be overlooked by the tourist. Above the half acre is a boiling lake of cerulean-hued water, the overflow from which winds its way in

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wavelets over beautiful formations tinted in blue and gold and purple and other delicate dyes. On this ever-changing surface the pine-clad sides and snow-crowned mountains are mirrored in spectacular splendor. This is a scene of singular beauty. Across the river, and far upon the slope beyond, in a group of blasted cedars, is the "Devil's Paint Pot," a boiling caldron of many-colored clays, bubbling and steaming like a soap vat. These colors combine, by chemical action, with each other, presenting an ever-changing tint. Some of the effects are exquisite in the extreme, and the eye never tires of the varying spectacle.

The mammoth hot springs are of a class with those in the geyser basin. The element of beauty enters into the formations from the deposits left by the water. These have been built up by ages of activity, and are in scalloped terraces. Their greatest activity is manifested at the base of Capitol Hill, on the picturesque bank of the Gardiner river. But there are unmistakable evidences of their activity for miles back, for cedar-crowned mounds yet yield treasures to the tourist who seeks specimens with a well-directed spade. In walking over some of the terraces where the water has ceased to run, the formation sounds hollow underneath, the action of the elements having built the terraces at the expense of the limestone beds below the surface. Caverns have been found underneath the now inactive basins, which are resplendent with stalactite and stalagmite formations that glisten under the blaze of a torch with singular brilliancy. Ascending the terraces to their apex, one may look down into pellucid pools of cerulean-hued water welling up from unknown depths, heated by mysterious agency, and flowing in wavelets over fantastic ledges of limestone formations from terrace to terrace, and finally sinking into an invisible channel, whence it finds its way into the Gardiner. Wire baskets, horseshoes and other metallic articles of ornamentation are most exquisitely enameled after hanging 20 or 30 hours exposed to the drippings of these springs. In the foreground of the formation resulting from the deposits left by the water is a mass of limestone towering 40 or 50 feet in the air, shaped like the cap of the Goddess of Liberty and bearing that title. It is entirely different in form and formation from anything about it.

In going from the Mammoth Hot Springs to the Falls of the Yellowstone the tourist must abandon his wagon at Tower Falls, if he is so equipped, and pack his outfit for the trail. The distance for packing, however, is but 18 miles, if he only desires to go to the falls, but if the lake be one of his objective points he must prepare for 40 miles or more of packing trip by stocking up his larder and rolling in all of his robes, for these are the coldest points in the park, the altitude being 8,000 feet, with the exceptions of Mount Washburne, whose head obtrudes over all. On this road to the Great Falls of the Yellowstone the principal point of interest are the Tower Falls, though the whole route is wild and picturesque, and if the snow is deep on the divide and in the mountains, the trail will be beset with game, and elk will become a familiar sight. Tower Falls are so called because of a towering mass of stone which rises up from the verge of the precipice to a height of about 100 feet from the water, where it breaks over the ledge. These falls are noted for their simple beauty, falling in solid sheets for 150 feet, and sending showers of spray curling up from the foaming pool below.

The trail from Tower Falls brings the tourists to a standstill and abruptly on the brink of an awful abyss, as it leads directly to the Grand Cañon, into the dizzy depths of which one gazes for the first time with mingled emotions of awe and admiration. On the opposite side of the stream the walls of the cañon rise abruptly for more than 2,000 feet, while on this there is a gradual descent half way down of sliding cinnabar and other delicately tinted chalky formations, broken at intervals by towering pinnacles of mineral rock, which stand out in bold relief against the brilliant background. These pinnacles take on many fantastic forms, inspiring the delusion that one is looking down upon the decaying splendors of antique architecture. From the base of these solemn sentinels, the descent to the water line is as abrupt as from surface to torrent on the opposite side. Far below winds the foaming current of white-crested wavelets spread out like a silvery band. Though the channel is 160 feet wide, it appears no larger than a trout stream. Rounding Point Lookout the tourist is confronted with a full view of the falls, where the whole volume of water breaks over a rock-ribbed ledge and is riven by a big black bowlder in the center, and again united rolls majestically down to a depth of 370 feet, sending up showers of spray which glisten in the sunlight like lustrous gems under gaslight. The view from this point is one of bewildering beauty. The spectacular splendors of the scene in the cañon below the falls is brightened by the effect of the roaring cataract on the senses. It is the most magnificent scenery of its class on the Continent, with the one exception of the Yosemite. Above the main falls is another which alone would be a great attraction, but is dwarfed into insignificance by the lower and larger one below. Above this, still, is a series of cascades, over which the vast volume of water from the lakes above rushes and breaks into foam everlastingly. These rapids can be heard for miles of a

still night, making much more noise than the roaring cataract at the falls. Here is the upper mouth of the cañon and the beginning of 10 miles of cañon scenery.

Six miles from the falls, on the road to the lake, is the Sulphur Mountain, an immense mound of pure sulphur crystal with a number of steaming springs at its base. The mountain seems to have been built up by deposits from these springs, and the formative processes are still at work on the adjacent plain. The overflow from the springs winds down the declivity toward the Yellowstone, leaving sulphuric deposits in its course. From Sulphur Mountain to the great lake the distance is 15 miles, and the trail winds along the picturesque bank of the Yellowstone. The river's source is not the lake, as many suppose; the lake might rather be called an expansion of the river, which is never narrower than about 120 feet from the lake to the Missouri, at Fort Buford, some 600 miles distant. The lake is said to have 300 miles of shore line, but it never has been fully explored. It certainly is the gem of the lakes, set as it is in a series of mountain peaks, pine-clad and snow-crowned. The monotony of its crested waves is broken by a verdure-clad island, giving it the appearance in summer of an emerald in a setting of brilliants. On the return trip from the lake the tourist will be repaid by short divergence from the trail for a glimpse of the Mud Volcano, which, while it was shorn of its symmetrical crater by a convulsion several years ago, is still a singular spectacle. Looking down into its deep and slimy crater one may see a mass of mud and water rushing athwart the aperture, ever and anon spurting toward the surface. At irregular intervals this slimy substance is shot high into the air, plastering the adjacent cedars now sapless and shorn of their green vestments by the hot blasts from below. These are the principal objective points of a tour of the park. There are many other interesting places, such as Gibbon Falls and cañon; Petrified Forests; Hoodoo, or Gaflin, Mountains; Mount Washburne, from whose summit may be seen the steaming geysers in the distance, and a general bird's-eye view gained of the whole picturesque plateau.

The following are the rules and regulations of the Yellowstone National Park, as promulgated by the Secretary of the Interior, July 1, 1900:

The following rules and regulations for the government of the Yellowstone National Park are hereby established and made public pursuant to authority conferred by section 2475, Revised Statutes, United States, and the act of Congress approved May 7, 1894:

(1) It is forbidden to remove or injure the sediments or incrustations around the geysers, hot springs, or steam vents; or to deface the same by written inscription or otherwise; or to throw any substance into the springs or geyser vents; or to injure or disturb, in any manner, or to carry off any of the mineral deposits, specimens, natural curiosities, or wonders within the park.

(2) It is forbidden to ride or drive on any of the geyser or hot spring formations, or to turn loose stock to graze in their vicinity.

(3) It is forbidden to cut or injure any growing timber. Camping parties will be allowed to use dead or fallen timber for fuel.

(4) Fires shall be lighted only when necessary, and completely extinguished when no longer required. The utmost care should be exercised at all times to avoid setting fire to the timber and grass, and any one failing to comply therewith shall be punished as prescribed by law.

(5) Hunting or killing, wounding or capturing of any bird or wild animal, except dangerous animals, when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed in the park under other circumstances than prescribed above, will be forfeited to the United States, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation, and the actual owner thereof was not a party to such violation. Firearms will only be permitted in the park on written permission from the superintendent thereof. On arrival at the first station of the park guard, parties having firearms will turn them over to the sergeant in charge of the station, taking his receipt for them. They will be returned to the owners on leaving the park.

(6) Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line, is prohibited. Fishing for the purposes of merchandise or profit is forbidden by law. Fishing may be prohibited by order of the superintendent of the park in any of the waters of the park or limited therein to any specified season of the year, till otherwise ordered by the Secretary of the Interior.

(7) No person will be permitted to reside permanently or to engage in any business in the park without permission, in writing, from the Department of the Interior. The superintendent may grant authority to competent persons to act as guides and revoke the same in his discretion, and no pack trains shall be allowed in the park unless in charge of a duly registered guide.

(8) The herding or grazing of loose stock or cattle of any kind within the park, as well as the driving of such stock or cattle over the roads of the park, is strictly forbidden, except in such cases where authority therefor is granted by the Secretary of the Interior.

(9) No drinking saloon or bar room will be permitted within the limits of the park.

(10) Private notices or advertisements shall not be posted or displayed within the park, except such as may be necessary for the convenience and guidance of the public, on buildings on leased ground.

(11) Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who violate any of the foregoing rules, may be summarily removed from the park, and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the superintendent of the park.

Any person who violates any of the foregoing regulations will be deemed guilty of a misdemeanor, and be subjected to a fine, as provided by the act of Congress approved May 7, 1894, "to protect the birds and animals in Yellowstone National Park and to punish crimes in said park, and for other purposes," of not more than one thousand dollars, or imprisonment not exceeding two years, or both, and be adjudged to pay all costs of the proceedings.

**Yellow-tail Moth,** a European moth, the *Liparis auriflua,* with wings satiny white, the fore ones with a black spot near

the anal angle; body white, the apex of the abdomen golden yellow. The caterpillar feeds on the hawthorn, spinning a web among its food. The perfect insect appears in July.

**Yellowthroat,** or **Maryland Yellow-throat,** a very common North American bird of the family *Sylvicolidæ*. It is 5½ inches long, the wing 2.4; and is readily distinguished by a band of black on the forehead, cheeks, and ear covers. The female is without the black band. This warbler builds its nest on the ground, and lays four to six white eggs speckled with light brown.

**Yelverton, Maria Theresa (Longworth),** an English writer. Besides "Martyrs to Circumstance" (1861), and "The Yelverton Correspondence" (1863), both relating to her notorious marriage with Major Yelverton, she wrote: "Zanita: A Tale of the Yosemite" (1871); "Fifty Thousand Miles of Travel Round the World" (1874); "Teresina in America" (1875).

**Yemen** ("the land to the right of Mecca"), a district in the S. W. of Arabia, bounded on the N. by Hedjas and on the E. by Hadramaut, and measuring about 400 miles in length by about 150 miles in breadth. At about 30 miles from the coast a range of wooded mountains (rising occasionally to 6,000 and 8,000 feet) stretches along the whole length of the country. Between this range and the sea stretches the scorchingly hot plain called Tehameh. Further inland the country becomes an elevated plateau. Though destitute of rivers, the whole region is very fertile, and coffee, tobacco, dates, gums, and spices are produced and exported in abundance. There are valuable pearl fisheries on the coast. The inhabitants are Arabs, but possess many distinctive characteristics, and are supposed to be descended from the ancient Sabæans. The government rests with the different sheiks or tribal chiefs, among whom the Imaun of Sana holds supreme authority. The principal towns are Sana, the capital, Mocha, and Hodeda Mareb. Aden is not now within the limits of Yemen. The Arabia Felix of the ancients, Yemen was conquered by the Abyssinians (A. D. 525) and Persians (597). In the year 628 it submitted to Mohammed, since the 16th century has been subject to Turkey, and after the extension of Turkish rule (1871–1873) was formed into a vilayet.

**Yen,** a Japanese money of account, issued in 1, 2, 5, 10, and 20 yen pieces (gold). A gold yen is equal to 49.8 cents in United States gold.

**Yenikalé** (yen-ē-kä′lā), **Strait of,** a body of water connecting the Black Sea with the Sea of Azof, is about 20 miles long, and in some parts only 2 miles broad and 2 fathoms deep.

**Yenisei,** the longest river of Siberia, rises as the Kem to the W. of the Kosso-Kol, S. of the Gurbi Mountains, flows W. as the Ulan ("Great") Kem between the Sayan and Tangnu Mountains, then suddenly breaks N. through the Sayan Mountains, and after a course of 3,440 miles falls into the Arctic Ocean. Its breadth varies from 3,400 feet to 14 miles, and during the last 140 miles it is so wide as to form an arm of the sea. Its depth varies from 11 to 90 feet. The waters of the Yenisei are clear and rich in fish. They are navigated by paddle steamers, drawing barges, and by a number of five or six cornered flat-bottomed boxes which convey flour down stream, and are broken up at their destinations. The Yenisei receives from the right the Upper Tunguska or Angara (the outlet of Lake Baikal), the Irkut, Middle Tunguska, and Lower Tunguska. Nordenskjöld's voyage in the summer of 1875 from Tromsö to the mouth of the Yenisei opened up a trade by sea with Northern Siberia, in which a number of vessels are now engaged, finding six weeks in summer when the passage to and from the Yenisei can be made with little difficulty.

**Yeniseisk,** a government of E. Siberia, Russia; bounded E. by Yakutsk and Irkutsk, S. by Mongolia, W. by Tomsk and Tobolsk, and N. by the Arctic Ocean; area, 981,607 square miles; pop. (1908) 689,700. The S. part is occupied with the Altai Hills and their offsets. In the Yenisei valley consiberable tracts are under tillage, but N. of the town of Yeniseisk this is succeeded first by pasturage, then by stretches ever more and more desolate, to the frozen tundras. The chief river is the Yenisei. Smaller streams are the Taimyr, Katanga, and Anabar, which like the Yenisei, form great gulfs at their mouths. The gold washings of Yeniseisk occupy 12,000 to 15,000 men and several thousand horses. Of the native tribes, who live by hunting, fishing, and trade in fur, the most are Samoyedes and Tungus. The capital is Krasnoiarsk.

**Yéolá,** a town in the Nassick District, Bombay presidency, British India; 130 miles N. E. of Bombay. It has special manufactures of silk and cotton cloth, woven on the hand loom with elaborate designs, with broad borders of gold or silver thread.

**Yeoman,** a term which seems, in early English history, to have been applied to a common attendant menial servant, but after the 15th century came to denote a class of small freeholders, forming the next grade below gentlemen. The term yeoman was also given to the 40-shillings freeholder, or, more loosely, to any small farmer or countryman above the grade of laborer. The term is also familiar in the titles of func-

tionaries in royal households, such as yeoman usher of the black rod, yeoman of the robes, etc.

**Yeomanry,** specifically, a force of volunteer cavalry first embodied in Great Britain during the wars of the French Revolution, and consisting to a great extent of country gentlemen and farmers. They are liable to be called out in aid of the civil power in case of riot at any time; in case of actual invasion, or the appearance of an enemy on the coast or during a rebellion, they may be assembled for actual service; they are then subject to the Mutiny Act and Articles of War, and may be called upon to serve in any part of Great Britain. During permanent service they receive cavalry pay and an allowance for forage. They undergo six days' training, and must attend a certain number of drills yearly, for which they receive 7s. a day as subsistence allowance, and 2s. for forage. Arms and ammunition are provided by the War Office, and there is an annual allowance of £2, or about $9.74, per man; but each man has to provide his own horse, which is exempt from taxation.

**Yeomen of the Guard,** in England, a veteran company, consisting of old soldiers of stately presence, employed on grand occasions in conjunction with the gentlemen-at-arms as the bodyguard of the sovereign. These yeoman were constituted a corps in 1485 by King Henry VII., and they still wear the costumes of that period. The officers of the corps are a captain (ordinarily a peer), a lieutenant, and an ensign — all old army officers. There are also a "Clerk of the Cheque" and four "Exons," besides non-commissioned officers (messengers, sergeant-majors, yeoman bed goers, yeoman bed hangers), and 100 privates. The Beef Eaters (see BEEF EATER), or Warders of the Tower, are, contrary to a common belief, an entirely different corps, but since the reign of Edward VI. have been privileged to wear the yeoman's uniform, without the shoulder belt.

**Yerba Maté.** See MATÉ.

**Yercum.** See MUDAR.

**Yerkes Observatory,** the observatory of Chicago University, at William's Bay, Wis., near the shore of Lake Geneva, 75 miles N. of Chicago, founded in 1892 by Charles T. Yerkes, of Chicago, and completed in 1895. The site, chosen with a view to escaping the smoke, dust, electric lights, and noise of a city, consists of 50 acres of wooded land. The observatory, in the form of a Roman cross, with three domes and a meridan room at the end of each, is 330 feet long from E. to W., and is the largest and most complete building for the purpose in the world. It has a hall through the center, and on either side of this, library, computing room, lecture room, museum, two spectroscopic laboratories, galvanometer room, chemical laboratory, photographing rooms, physical laboratory, optician's room, and a workshop. The great dome, the largest in the world, 90 feet in diameter and weighing 70 tons, is at the W. end. It is revolved, and the shutter opened and closed, by an electric motor, which also raises and lowers the floors. Under this dome is the immense Yerkes telescope. Two lesser domes house two other telescopes, besides which the observatory has sidereal and mean-time clocks, a solar spectograph, a stellar spectograph, a position micrometer, a photoheliograph, a meridian circle, and a transit instrument. The heliostat room is 100 feet long by 12 feet wide, and has an iron roof which rolls off to the S. The heliostat, with plain mirror 12 inches in diameter, is on a pier at the N. end of the room. The building containing the engines, dynamos, and boilers for generating power and heat, is for safety, several hundred feet distant from the observatory. In the instrument shop it is hoped it will be possible to construct instruments and laboratory apparatus for advanced investigation, under the immediate supervision of those who are to use them. The observatory issues several publications, including irregularly issued bulletins containing announcements of discoveries and results, and the "Astrophysical Journal." Its director is Prof. George E. Hale. Dr. T. J. J. See is Professor of Astronomy in Chicago University. See OBSERVATORY: TELESCOPE.

**Yerkes, Charles Tyson,** an American capitalist; born in Philadelphia, Pa., June 25, 1837; was engaged as exchange broker in 1858–1861, and as banker in 1861–1886. He failed in 1871, and for misappropriation of public funds was convicted and imprisoned, but was afterward pardoned. He recovered his fortune in a few years; was prominent in street railway operations in Philadelphia, and after 1886 in Chicago, where he was at the head of several railway corporations. In 1902 he was engaged in constructing a system of underground railroads in London, England. In 1892 he gave the University of Chicago the great telescope bearing his name. Died Dec. 29, 1905.

**Yew,** the genus *Taxus,* specifically *T. baccata,* under which Sir J. Hooker places its six supposed species. An evergreen with spreading branches, linear acute leaves more or less falcate, coriaceous, shining above, paler below, arranged in two ranks. Male catkins yellow, about a quarter of an inch long; females minute; fruit a red mucilaginous drupe or berry with green seed. It is indigenous in most parts of Continental Europe and in the Himalayas 6,000 to 10,000 feet above the sea-level, being in the last-named regions a much loftier tree than in

England. The sap wood of the yew is white, the heart wood red, hard, close-grained, and susceptible of a fine polish. It weighs 59 pounds to the cubic foot. It is prized in Europe by cabinet makers, and was formerly much used in England, as it still is in the Himalayas, for bow making; this is said to be at least one reason why our ancestors planted it in so many English churchyards. In some parts of the Khasia hills in Nepal the yew is deemed sacred, and its wood is burned as incense. In Tibet a viscous exudation from it, mixed with other gums, is similarly employed. A red dye is made from the tree in the Bhutia country. Bentley and Trimen state that the leaves and young branches in all circumstances act as a narcotico-acrid poison on human beings, horses, and cows; that the seed of the fruit is poisonous, but that the pulp surrounding it is not so. The bark is used in Kunawar as a substitute for tea, or is mixed with tea leaves. In India its leaves and fruit, which somewhat resemble digitalis in their effects, have been employed as a lithic in calculus, and as an antispasmodic in epilepsy and convulsions. There is an advantage in yew over digitalis — that the former does not accumulate in the system like the latter.

BRANCH OF YEW.

**Yezd,** a city of Persia; province of Faristan; in an oasis in a sandy plain 190 miles S. E. of Ispahan. It is noted for its velvet and other silk manufactures, and contains about 4,000 fire worshipers. It is said that they have kept the sacred fire burning for more than 3,000 years, without suffering it ever to go out. The sacred fire is on the mountain Ater Quedah ("Mansion of the Fire"), and he who dies away from the mountain is deemed unfortunate. Pop. 40,000–45,000.

**Yezidi,** or **Yezidee,** a sect of religionists who, while admitting that God is supreme, yet believe the devil to be a mighty angel deserving of worship. Probably they were originally Zoroastrians, whose faith became partly modified by the Christians and Mohammedans with whom they ultimately came in contact. They live near the Euphrates, and were visited by Mr. Layard in 1841.

**Yezo,** or **Ezo,** less correctly YESSO, native HOKKAIDO, the most N. of the four great islands of Japan; still only partially settled; area, 36,299 square miles; pop. (1903) 843,615. Its official name is Hokkaido, or "Circuit of the Northern Sea," received in 1870, when it was brought under a special colonization department. An agricultural mission from the United States assisted in founding model farms, laying out roads, and building bridges. The capital was changed from Matsumae to Sapporo, which was provided with a railroad to Otam, its port, and to Poronai, the great coal district inland. An agricultural college, breweries, canning factories, beetroot sugar factories, etc., were established, but with inconsiderable results. The coal mines are worked by convict labor. A system of military settlements has of late years been put into force, partly with the view of furnishing a militia against possible invasion from Russia, which is supposed to covet the fine harbors of Yezo. The exposed port of Otam will probably be soon abandoned for the more sheltered harbor of Mororan, on Volcano Bay, now a naval harbor, to which a railway from Poronai mines has been built. The principal products of Yezo are coal, seaweed, sulphur, fish, the catches of salmon on the river Ishikari being sometimes enormous. The fauna and flora of Yezo differ materially from those of the main island, the bear being a different species, resembling the grizzly. There are no monkeys; a species of grouse is found. The deer, once very plentiful, are now comparatively scarce. The Yezo pony, originally from Nambu on the main island, is hardy, and foreign blood has been introduced, promising good results. The original inhabitants of Yezo were probably pit dwellers, of whom distinct traces have been found at Sapporo, Nemuro, and esewhere. After these came Ainos or Ainus, whose principal settlement is at Piratori, 50 miles E. of Mororan. The bear festival in September, is the great event of their year. The Ainos number 15,000, a population either stationary or decreasing; they are harmless, lazy, and drunken. The S. corner of the island was wrested from them in the 16th century, and the castle of Matsumae, in the extreme S. W., became in the next century the headquarters of Japanese

rule. At the restoration in 1868 the supporters of the Tokugawa government made a last stand here, and were finally defeated at Hakodate. Yezo has a rigorous climate, being for six months of the year under snow and ice (two feet in the S. to eight feet in the N.). The center of the island is but little known, though it has been crossed twice or thrice by Japanese and European explorers; the Ainos live mostly near the mouths of the rivers. The interior is mountainous and inhospitable; there are several active volcanoes. Pop. town (1908) 87,875.

**Ygdrasil,** or **Yggdrasill** (ig'dra-sil), in Scandinavian mythology, the giant ash tree spread over the whole world reaching above the heavens, symbolizing the universe, the branches of which reach down to the under world, or Scandinavian hell.

**Ymbert, Jean Albert** (*ang*-bār'), a French writer of comedy; born about 1786. He wrote: "A Husband Unknown to Himself"; "The Art of Getting Office" (1817); "A Bachelor's Dinner" (1820); "The Automaton Man" (1820); "The Obliging Man" (1820); "The Propertyless Proprietor" (1820); "The Neutral City; or, The Burgomaster of Neustadt" (1825). He died in 1846.

**Ymir** (ē'mir), in Scandinavian mythology, the personification of Chaos, or the first created being, produced by the antagonism of heat and cold.

**Y Moth,** the *Plusia gamma,* a species of lepidopterous insect, well known in Great Britain and on the Continent; derives its name from the presence of a mark on the front wings resembling the letter Y or the Greek gamma. It is one of the day-flying moths, and its larva, a caterpillar, feeds on the pea, bean, turnip, cabbage, and other vegetables. Occasionally in France the larvæ are very destructive to gardens and crops. The average length of the moth is one inch.

**Yoder, Robert Anderson,** an American educator; born in Lincoln co., N. C., Aug. 16, 1853; was graduated at North Carolina College in 1877; had charge of the Concordia High School, North Carolina; ordained in 1879; held pastorates in North Carolina; president of the Concordia College in 1888–1891; and became president of Lenoir College, North Carolina, in the latter year.

**Yoga,** one of the six Darsanas, *i. e.,* schools or systems of Brahmanical philosophy, that of Patanjali, the essence of which is meditation. It believes in a primordial soul which has had existence from an earlier period than primeval matter, and holds that from the two arose the spirit of life (Mahanatma). Theoretically at least, its devotees can acquire even in this world entire command over elementary matter by certain ascetic practices, such as long continued suppression of the respiration, inhaling and exhaling the breath in a particular manner, sitting in 84 attitudes, fixing the eyes on the tip of the nose, and endeavoring, by the force of mental abstraction, to unite themselves with the vital spirit which pervades all nature and is identical with Siva. When this mystic union is effected, the Yoga can make himself lighter than the lightest, or heavier than the heaviest substance, or as small or as large as he pleases; he can traverse all space, can become invisible, can equally know the past, the present, and the future, and can animate any dead body by transferring to it his own spirit; finally he becomes united with Siva, and is exempt from the necessity of undergoing further transmigrations.

**Yoke,** that which joins together; a piece of timber, hollowed or made curving near each end, and fitted with bows for receiving the necks of oxen, by which means two are connected for drawing. A frame of wood fitted to a person's shoulders for carrying a pail, etc., suspended on each side. A chain; a link; a band of connection. A couple; a pair; as, a yoke of oxen. A mark of servitude; service; slavery; bondage. To put a yoke on; to join in a yoke; to couple; to join with another; to enslave; to bring into bondage; to restrain; to confine.

Yokes of iron are mentioned by Moses B. C. 1451 (Deut. xxviii: 48), and it is believed that such were actually used by slaves during the Scriptural period. The ancients regarded it as a symbol of slavery, and it was customary for vanquished armies to pass under a yoke, formed like a gallows, of two upright spears, and a third fixed transversely at top. The Samnites exacted this mark of submission from the Romans after their victory at the Caudine Forks, B. C. 321; and were themselves compelled to undergo the same humiliation B. C. 307 and B. C. 294.

**Yoke Arbor,** in machinery, a form of double journal box for pulley spindles, in which a curved branch extending from one bearing to the other on each side of the pulley serves to protect the belt from being chafed or otherwise injured.

**Yoke Fellow,** one associated with another in labor, a task, undertaking, or the like; one connected with another by some tie or bond; a companion, an associate, a mate, a partner.

**Yokohama,** the chief port of entry in Japan, and the headquarters of foreign shipping companies, banks, consulates, and commerce generally. Till the opening of the country in 1854 it was an insignificant fishing village, continguous to the impor-

tant town of Kanagawa, originally granted as a treaty settlement. The obstructions offered by the Japanese and the impatience of foreign merchants led to the practical abandonment of Kanagawa, which, however, still remained nominally the seat of the various consulates. Yokohama is a poorly laid-out town with narrow winding streets. The Bluff, however, conceded for residence in 1867, is a beautiful spot, commanding fine views of Fuji-san and of Yokohama bay. The bay is very beautiful, and, though only an open roadstead, affords a good and commodious anchorage, not only to extensive mercantile shipping, but also to the naval squadrons of Great Britain, France, Germany, Russia, the United States, and other powers. Work on a large harbor was carried out in 1889–1896, the main object of which was to prevent the gradual silting up of the anchorage; it is enclosed by two breakwaters 1¼ miles long, and an iron pier, 1,900 feet long, connected with the railway to the capital, 17 miles off. Yokohama is a center for tourists visiting Japan. The foreign community here is the largest in the country; after the Chinese, British residents, chiefly merchants and brokers, bulk most largely. There is an imperial health laboratory here, admirably conducted. The entire foreign trade of Yokohama aggregates from $75,000,000 to $100,000,000 a year, the exports having a value of nearly double the imports. Silk represents three-fifths of the exports, the rest being other tissues, tea, rice, copper, curios, etc.; the imports are cottons and woolens, raw sugar, oils, metals, chemicals, arms, and ammunition, watches, etc. Pop. (1908) 394,303.

**Yolk.** See VITELLUS.

**Yonge, Charles Duke** (yung), an English historian; born in 1812. He published: "An English-Greek Lexicon" (1849); "A New Gradus ad Parnassum of the Latin Language" (1850); "Three Centuries of English History" (1872); "Three Centuries of English Literature" (1872); "A Life of Marie Antoinette, Queen of France" (1876); etc. He died Dec. 1, 1891.

**Yonge, Charlotte Mary,** an English novelist; born in Otterbourne, Hampshire, England, Aug. 11, 1823. She published more than 30 novels, usually of "High Church" tendencies, the most popular of which are: "The Heir of Redclyffe" (1853); and "Daisy Chain; or, Aspirations" (1856). The profits of the former were largely given by her to fitting out the missionary schooner "Southern Cross" for Bishop Selwyn, of New Zealand; those of the latter ($10,000) to the erection of a missionary college at Auckland, New Zealand. Among her historical and biographical works are: "The Kings of England" (1848); "Landmarks of History, Ancient, Middle Age, and Modern" (1852–1857); "The Victorian Half-Century" (1887); etc. She died in Winchester, March 24, 1901.

**Yonkers** (yungk'urs), a city in Westchester co., N. Y.; on the Hudson river and on the New York Central and Hudson River railroads; immediately adjoining New York city on the N. It is noted for its beautiful suburban residences, many of which are built on the terraces of the Hudson, the shore of which here reaches an altitude of 425 feet above tide water thus giving grand views of the river and the opposite shore. Here are Lowden and Halsted Schools, a high school, public library, Hebrew Home for the Aged and Infirm, the Leake and Watts Orphan Home, Homœopathic Home, St. Joseph's Hospital, St. John's Riverside Hospital, and "Graylock," the summer residence of the late Samuel J. Tilden. The Phillipse Manor, built in 1682, is now used as the city hall, and nearby is Locust Hill, where the American troops were encamped in 1781. In the suburbs are the Convent of Mount St. Vincent and the former residence of Edwin Forrest, now used as the art gallery of the convent. Yonkers owns a system of waterworks, costing $1,577,000, with 80 miles of mains, and a capacity of 3,626,564 gallons; the streets are lighted by gas and electricity at a cost of nearly $78,000 per annum; and there is a sewer system covering 60 miles. The public school enrollment is over 8,000, and the city government is maintained at an annual cost of about $830,000. The city has manufactories of carpets, hats, elevators, sugar, maltine, tools, chemicals, silk goods, etc. The assessed property valuations exceed $38,000,000, and the total bonded debt is about $3,730,000. Pop. (1900) 47,931; (1910) 79,803.

**Yonne** (yon), a department of France; surrounded by the departments of Seine-et-Marne, Aube, Cote-d'Or, Nièvre, and Loiret; area, 2,868 square miles; pop. (1906) 315,-199. The department is watered by the Yonne river, which flows across it in a N. E. direction. The surface is hilly, many of the hills being covered with fruitful vineyards, the intervening valleys being beautiful and fertile. There are some fine forests in the department. The vineyards yield large quantities of wine, the best being those of Chablis, Auxerre, and Tonnerre. The chief mineral products are red granite, marble, limestone, and ochre; and there are some miscellaneous manufactures. Capital, Auxerre; pop. (1901) 16,291.

**Yooga.** See YUGA.

**Yoosufzye,** or **Yusufzai** ("children of Joseph"), a numerous Afghan tribe, on

the N. W. frontier of India, occupying about 2,000 square miles within the British district of Peshawur and also the hills beyond the N. boundary. Their total number is estimated at 246,000, including 73,000 fighting men. Of these 80,000 are British subjects; 800 are serving the Bengal army, and 360 in the Punjab irregular force. The crops of their territories are wheat, barley, millets, maize, cotton, and mustard seed. They export iron, cattle, and wool; and their transit trade is considerable. Those within British territory have become good subjects.

**Yoredale Series,** in geology, the name given by Phillips to a series of beds in Yorkshire, England, of Mountain Limestone age. He divided them into (1) an Upper Limestone belt, consisting of alternations of limestone, often cherty, with sandstones, shales, and coal seams, thickness, 80 to 300 feet; and (2) Flagstone series, consisting of alternations of flagstones, grits, shales, coal seams, and a few beds of limestone, thickness, 250 to 400 feet.

YORK CATHEDRAL.

**York,** a city and county-seat of York co., Pa.; on Codorus creek, and on the Pennsylvania, the York Southern, the Western Maryland, and the Northern Central railroads; 28 miles S. S. E. of Harrisburg. Here are a Young Ladies' Seminary, Collegiate Institute, County Academy, business colleges, court house, numerous churches, several libraries, hospital and dispensary, street railroads, electric lights, a number of public parks, several National and other banks, and daily, weekly, and monthly periodicals. It has foundries, car shops, manufactories of agricultural implements, shoes, condensed milk, wall paper, iron and steel, organs and pianos, cigars, soap, hosiery, wire cloth, carriages and wagons, etc., and an assessed property valuation of nearly $17,000,000. In 1777 the Continental Congress met here while Philadelphia was occupied by the British army. Pop. (1900) 33,793; (1910) 44,750.

**York** (Latin, Eboracum), a cathedral city and archbishop's see, a municipal and parliamentary borough, and capital of Yorkshire, England, 188 miles N. of London, at the confluence of the Foss and the Ouse. The city proper, embracing a circuit of nearly 3 miles, was inclosed by walls, restored by Edward I., the portions of which still remaining have been converted into promenades, commanding a prospect of the surrounding country. There are many quaint old-fashioned houses in the narrow streets of its older portion. The great object of attraction, however, is the minster or cathedral, the finest in England, which dates from the 7th century, but did not begin to assume its present form till the 12th century, and was not complete till 1472. It is built in the form of a Latin cross with choir, aisles, transepts, a central tower and two W. towers; extreme length, 524 feet; breadth, 250; height of central tower, 213 feet (see cut). York was the capital of Roman Britain. It was made an archiepiscopal see by Edwin of Northumbria in 624. It still ranks second among English cities, its archbishop having the title of Primate of England, and its chief magistrate takes the title of lord-mayor. It was incorporated by Henry I., and the city boundaries were extended in 1884. The trade is local, and the industries unimportant. Pop. (1901) 77,790.

**York,** a river of Virginia; formed by the union of the Pamunkey and Mattapony, flowing S. E. to Chesapeake bay, nearly opposite Cape Charles; 40 miles long by from 1 to 3 miles wide.

**York, House of,** an English royal family, rival to that of Lancaster, and possessor of an elder right to the crown. The first duke of York was EDMUND PLANTAGENET, called also de Langley, fifth son of Edward III. His second son, Richard, Earl of Cambridge, married Anne Mortimer, daughter of Roger, Earl of March, and granddaughter of Lionel, Duke of Clarence, the third son of Edward III. On the line of this king's eldest son becoming extinct in 1399, by the death of Richard II., the issue of Anne Mortimer inherited the true representation of Edward III. The rival house of Lancaster was descended from JOHN OF GAUNT, Duke of Lancaster, and fourth son of Edward III. The house of York furnished three kings to the throne of England: EDWARD IV., EDWARD V., and RICHARD III. The house of Tudor, which supplanted it, was allied to it by the marriage of Henry Tudor, afterward Henry VII., with Elizabeth, eldest daughter of Edward IV. In the struggle between the houses of York and Lancaster, the partisans of the former were distinguished by a white, and those of the latter by a red rose. Hence the title "War of the Roses."

**York College,** a coeducational institution in York, Neb., founded in 1890 under the auspices of the United Brethren Church; has grounds and buildings valued at over $80,000; endowment funds exceeding $35,000; scientific apparatus, etc., $16,000; volumes in the library, about 22,000; average number of faculty, 17; average student attendance, 500; graduates, over 450.

**York Peninsula,** in Queensland, Australia, the region lying on the E. side of the Gulf of Carpentaria, and terminating at its N. end in Cape York.

**Yorktown,** a town and county-seat of York co., Va.; on the York river; 7 miles W. of Chesapeake bay. Here is the oldest custom house in the United States. The city has several public schools, and a monument commemorating the surrender of the British army under Lord Cornwallis. It is historically famous for its two sieges in 1781 and 1862. In the first the British, numbering 8,000 made a stand and threw up earthworks, in August, 1781, and were supported by several vessels in York river. Washington with an army of 16,000, including 7,000 Frenchman, and aided by a French fleet under Count de Grasse, forced the surrender of the place, Oct. 16, 1781. The total loss of the allied troops was about 300, and that of the British about 550. This was the last important action in the Revolutionary War. In the spring of 1862 the city was occupied by 50,000 Confederates under General Johnston and Magruder. On April 5, General McClellan laid siege to it with 90,000 men. The Confederates withdrew from the city on May 3, and were pursued till the 5th, when the battle of Williamsburg was fought, resulting in a victory for the Union army. Pop. (1890) 151; (1900) 221.

**Yorktown, The,** a United States twin-screw, steel gunboat; displacement, 1,710 tons; length, 230 feet; breadth, 36 feet; mean draft, 14 feet; horse power, 3,392; armature, main battery, six 6-inch breech-loading rifles; secondary battery, two 6-pounder and two 3-pounder rapid-fire guns, two 37-millimeter Hotchkiss revolving cannons and two Gatlings; crew, 14 officers and 178 men; cost, $455,000; speed, 16.14 knots.

**York von Wartenburg, Hans David Ludwig, Count,** a Prussian Field-Marshal; born in Potsdam, Prussia, Sept. 26, 1759. He entered the army in 1772; was cashiered for insubordination; and served the Dutch in the East Indies; but returning to the Prussian service gained glory in the wars of 1794, 1806, and 1812. He was especially distinguished during the War of Liberation and the invasion of France (1813–1814). Ennobled in 1814, he was made a Field-Marshal in 1821. He died in Klein-öls, Silesia, Oct. 4, 1830.

**Yoruba** (yō′-), a country of West Africa, N. of the Bight of Benin. It is peopled by a number of confederated tribes, and is now attached to the colony and protectorate of Lagos. Much of the country is fertile and well cultivated, and the inhabitants have made great progress in the industrial arts. They are chiefly pagans, but Mohammedanism has made way among them. Protestant and Roman Catholic missions have long been at work among them. Ibadan is the largest town.

**Yosemite Valley,** a cleft in the W. slope of the Sierra Nevada, about the center of California, and 140 miles E. of San Francisco. The name Yosemite is an Indian word which signifies "large grizzly bear." This celebrated valley, noted for the sublimity and beauty of its scenery, is about 7 miles long and from ½ to nearly 2 miles in breadth, and is tranversed by the Merced river. When one arrives in the valley, at the bottom of the cañon, he finds himself as it were in a room. The floor of the room is a mixture of meadow and woodland, and a river runs across it, entering by a door at one end and going out by a door at the other end. The river averages about 50 yards in width. Through a second door in the upper end another stream (Jenayale creek) comes into the room, but joins the Merced soon after entering. If you are an angler, you may get some rainbow trout (*Salmo iridens*) out of the Merced; but the fishing here is nothing like as good as in the South Fork of the Merced, which the road

Yosemite Valley

crosses at Wawona. The walls of the room are of granite — a bright steel gray, for the most part, in the sunshine, but frescoed here and there in darker tints — purples and others. The walls are in places quite plumb, in others nearly plumb, and elsewhere they have a tendency to tilt back a little. At the upper edges they are hacked and gouged out of all semblance of regularity or neatness. It would be next to impossible to put a roof on the room without leaving large gaps underneath. The chips and splinters made by the hacking and gouging lie in vast heaps piled up against the lower part of the walls, and are generally overgrown with forest vegetation.

As to size, the room is a little more than 7 miles long. Between the heaps of chips the floor varies in width from one-quarter to three-quarters of a mile, and above the chip heaps the distance between the walls is from 2 miles down to half a mile. It is the height of the walls that is of most interest to people who love figures. The average height from the floor up is nearly 3,000 feet. In their different parts the walls are called by different names, and here are some of the heights of the parts:

| | Feet. | | Feet. |
|---|---|---|---|
| Cathedral Spires | 2,678 | El Capitan | 3,300 |
| Yosemite Point | 3,030 | North Dome | 3,600 |
| Sentinel Rock | 3,069 | Eagle Peak | 3,830 |
| Glacier Point | 3,250 | Sentinel Dome | 4,160 |

Pretty high walls for a room; but the heights given are low compared with that of the wall at the upper end. That part called the Half Dome (or South Dome) lacks little of being 5,000 feet from top to bottom, and for at least 2,000 feet from the top downward it is straight as a plumb line. Below that there is a slight inclination, but such a slight one that the general effect of the wall on the eye is one of verticality for the whole distance. That effect is, indeed, characteristic of the walls in nearly all their parts, even where they have, in fact, a considerable slope. The effect is the same whether you are looking up at them from the floor or whether you have climbed up to the top and are peering down over the edge.

As to conveying any idea of what a granite wall 5,000 feet high, or even 3,000 feet, looks like — figures will not do it. The human faculties cannot grasp such measurements of the perpendicular. But people who are used to looking up at the walls of Yosemite or down from the tops of them make very little account of Eiffel Towers and that sort of thing. If the Eiffel Tower were standing on the floor of the Yosemite room and you were looking down at it from, say, Eagle Peak, you might easily take the tower to be a queer bit of bric-a-brac, resembling possibly the burned stump of a California big tree.

Next consider the great torrents of water pouring over the top of the walls here and there along each side, through gaps made by the hacking and gouging. The streams are not broad like Niagara, nor even as wide as the Rhine Falls at Schaffhausen, but what they lack in width is more than made up by length. For example, the Bridal Veil Fall, which drops from a low part of the wall, measures 900 feet from top to bottom. It makes one clear drop of 600 feet, and comes down the other 300 by a series of jumps. The Ribbon, the Sentinel, and the Royal Arch are falls that, after rolling over the edge, must get through space to the tune of from 2,000 to 2,500 feet before arriving at the floor. There are a lot of others — two very beautiful, called the Vernal and the Nevada — in the passage through which the Merced river approaches the big room; but the most notable of all, as far as figures go, is the Yosemite Fall. This one makes a clean skip of about 1,450 feet (the measurements varying from 1,436 up to 1,500) from the first jumping-off place; then in a succession of hops it comes down 626 feet lower, and then it drops 400 feet, straight down. After that it goes downward in a series of cascades a further matter of 80 or 100 feet. Altogether the height of the fall is reckoned at 2,550 feet, unquestionably the highest yet discovered in any land, while the first plunge is the longest made by any known cataract.

John Conness, United States Senator from California, induced Congress in 1864 to pass a bill setting apart the Yosemite Valley and the compassing heights as a public park or pleasure ground. At that time Yosemite was scarcely as much as a name to the world at large, but some Californians had discovered that the place had immense prospective value as "the greatest show on earth," and very naturally they had set about obtaining possession of such "show" by settling in the valley with the expectation of acquiring title under the preëmption law. Through the act above mentioned those settlers were dispossessed, compensation being given for such "improvements" as had been made.

The act was as follows:

"Be it enacted, etc. That there shall be and is hereby granted to the State of California the cleft or gorge in the granite peak of the Sierra Nevada Mountains, situated in the county of Mariposa, in the State aforesaid, and the head waters of the Merced river, and known as the Yosemite Valley, with its branches or spurs, in estimated length 15 miles, and in average width 1 mile back from the main edge of the precipice on each side of the valley, with the stipulation, nevertheless, that the said State shall accept this grant on the express conditions that the premises shall be held for public use, resort, and recreation; shall be inalienable for all time; but leases not exceeding 10 years may be granted for portions of the premises. . . . Incomes from leases to be expended in preservation and improvement of the property. . . . The premises to be managed by the governor of the State, with eight other commissioners, to be appointed

by the executive of California, and who shall receive no compensation for their services."

In 1866, at the first session of the California Legislature after the passage of the above act by Congress, the grant was accepted by this State. The grant covers an area of 38,111 acres — mostly rock. While this tract is quite unique in the variety and excellence of its beauties, it is, after all, only one detail in a much more extensive region, abounding at all points with sights but little less imposing than those of Yosemite. If the latter were blotted out of existence, the region would still remain a marvel in the domain of mountain scenery. It is a land of gigantic shapes in granite — the most marked peculiarity being, as in the Yosemite, the great height and the verticality of the rock walls, and the frequency of the domelike formations with which the walls are topped.

It is also a land of lakes of the most captivating picturesqueness, a land of fishing streams, and of many waterfalls, of stretches of meadow made beautiful by nature to temper the mountains' harshness, and of belts of regal timber draping the rocky slopes. It is, too, a land of snow, where at the greater elevations the snow never entirely disappears, and where at lesser altitudes the earth is white during between six and eight months of each year. This feature is by no means the least valuable part of the region's character.

**Youatt, William,** an English veterinarian; born in England, in 1777. He was for many years professor at the Royal Veterinary College, and coeditor of the "Veterinarian," established in 1828. He published a standard work on "The Horse" (1831), also a book on "The Dog" (1842), and others; all considered of high value in their line. He died in London, Jan. 9, 1847.

**Youghal** (yâ'hul, or yâl), a seaport of County Cork, Ireland, on the estuary of the Blackwater, 27 miles E. of Cork. The town has some structures of interest — the parish church, which is formed of the nave and aisles of the ancient collegiate church, built by the Earl of Desmond in 1464; the "water gate" and the "clock gate"; and Sir Walter Raleigh's house, Myrtle Grove, which remains nearly in its original state. There is a handsome Roman Catholic church, and remains of several ancient conventual and other buildings. Parts of the old walls are standing. The trade of Youghal lies chiefly in the export of agricultural produce; the harbor is obstructed by a bar. According to local tradition, the potato was first planted at Youghal by Raleigh, who was mayor in 1588.

**Youmans, Edward Livingston,** an American scientist, long the editor of the "Popular Science Monthly"; born in Coeymans, N. Y., June 3, 1821. His chief works are: "Alcohol and the Constitution of Man" (1854); "Hand-Book of Household Science" (1857); "Correlation and Conservation of Forces" (1864); "The Culture Demanded by Modern Life" (1867); etc. He died in New York city, Jan. 18, 1887.

**Youmans, William Jay,** an American chemist; born in Milton, Saratoga co., N. Y., Oct. 14, 1838. He published a book, "Pioneers of Science in America" (1895); edited Huxley's "Lessons in Elementary Physiology," adding a second part, "Elementary Hygiene" (1867); and was for a number of years editor of the "Popular Science Monthly," succeeding his brother Edward. He died in Mount Vernon, N. Y., April 10, 1901.

**Young, Andrew White,** an American political economist; born in Carlisle, N. Y., March 2, 1802. He wrote: "Introduction to the Science of Government" (1835); "First Lessons in Civil Government" (1843); 'Citizen's Manual of Government and Law" (1851); "The American Statesman: A Political History of the United States" (1855); "National Economy: A History of the American Protective System" (1860). He died in Warsaw, N. Y., Feb. 17, 1877.

**Young, Arthur,** an English political economist; born in Suffolk, England, Sept. 11, 1741. He became a farmer, and made a series of agricultural tours in England, Ireland, and France, publishing accounts of them, which were very favorably received, and in 1793 he was appointed secretary to the newly constituted Board of Agriculture. Of his many writings his "Travels in France," published in 1792, is the most interesting, from its sketches of the social as well as the agricultural condition of the French provinces just before and just after the revolution of 1789. He died in London, April 20, 1820.

ARTHUR YOUNG.

**Young, Bennett Henderson,** an American lawyer; born in Nicholasville, Ky., May 25, 1843; was educated at Bethel Academy, Nicholasville; Center College, Danville, Ky., Queen's College, Toronto, Canada, and at the Law Department of Queen's

College, Belfast, Ireland, from which he was graduated; served in the Confederate army under Gen. John H. Morgan in the Civil War; and represented Kentucky at the Paris Exposition in 1878. He was author of "History of the Constitutions of Kentucky" (1890); "History of Evangelistic Work in Kentucky" (1891); "History of the Battle of the Blue Licks" (1895); "History of Jessamine County, Ky." (1898); "History of the Division of the Presbyterian Church in Kentucky" (1898); "History of the Battle of the Thames" (1901); etc.

**Young, Brigham,** an American Mormon; born in Whitingham, Vt., June 1, 1801. His father was a farmer, and he himself learned the trade of painter and glazier. Early in life he joined the Baptists, but when about the age of 30 was converted to Mormonism, and openly joined the sect at Kirtland, O., in 1832. In 1835 he was ordained an elder and sent forth among the 12 apostles, the New England States being the district assigned to him. Here he is said to have been very successful in his proselytizing labors. On the death of Joseph Smith, in 1844, he was unanimously chosen president and prophet, though he had three competitors for the office, one of whom, Sidney Rigdon, he soon afterward excommunicated. On the forcible expulsion of the sect from Nauvoo, Ill., President Young led them through toils and dangers, which nothing but the most admirable energy could have conquered, over the plains and table-lands to the splendid valley in the heart of the Rocky Mountains, where, between the Wasatches and the Great Salt Lake, he founded (July, 1847) the present Salt Lake City. His immediate followers forming a nucleus, others poured into "the Promised Land," and in 1849 an attempt was made to organize a State, to be called the State of Deseret, that being the official name given by the



BRIGHAM YOUNG.



Mormons to district. The United States government refused to sanction the new State, but Utah was organized as a territory, and Young appointed governor. The appointment of a "Gentile" governor in 1854 led to serious troubles, as Young and the other Mormons refused to recognize his authority, and it was not till a force of 2,500 troops was sent out in 1857 that the United States government could enforce its forms on the turbulent sectaries.

Young was the founder of polygamy as an institution, and was among the first to practise it. In 1852 he promulgated the "celestial law of marriage," which he declared to have been revealed to Joseph Smith nine years before. A large party, among whom were Smith's wife and sons, in the Church opposed the innovation, and declared the revelation to be a forgery, but Young's influence carried the day. He himself had from 15 to 18 actual wives, besides numerous spiritual wives who were formally "sealed" to him. He was twice indicted for polygamy, but each time the case fell through. His 15th wife sued for a divorce in 1875. The barbarous Mountain Meadow Massacre of 1858 was brought to the notice of the law in 1875 In it a train of 136 emigrants, who had come into collision with the Mormon settlers, was practically exterminated, only a few children being allowed to escape. The court exonerated Young from complicity in the affair, though the suspicion was never satisfactorily cleared away, but "Bishop" Lee, a leading Mormon, was condemned to death in 1876, and shot in March, 1877, on the scene of the massacre. Brigham Young was a man of undoubted ability, strength of character, and shrewdness. He died in Salt Lake City, Aug. 29, 1877. See MORMONS.

**Young, Charles Augustus,** an American astronomer; born in Hanover, N. H., Dec. 15, 1834; was graduated at Dartmouth College (1853), Professor of Mathematics, Physics, and Astronomy in Western Reserve College (1857–1866); captain of a company of the 85th Ohio Volunteers (1862); Professor of Astronomy and Physics in Dartmouth College (1866–1877); Professor of Astronomy in the College of New Jersey, at Princeton (1877). He was a member of the eclipse parties to Iowa in 1869, and to Spain in 1870; of the transit of Venus party to Peking, China, 1874, and organized the Princeton eclipse expedition to Denver in 1878. He discovered the green line of the solar corona in 1869, and identified it with the line 1,474 of Kirchoff's scale. At the 1870 eclipse he discovered the so-called "reversing layer" surrounding the solar photosphere, and in 1872 at Sherman, Wyo., detected the bright reversal of many lines of the solar spectrum in ordinary sunlight.

At Dartmouth College he made the first determination of the sun's rotation from the displacement of the lines of its spectrum at the E. and W. limbs, and he was recognized as one of the leading authorities in spectroscopy and in all matters relating to the sun. He was a lecturer in the courses of the Peabody Institute at Baltimore, the Lowell Institute at Boston, and at many colleges. He wrote: "The Sun" (1882), and "General Astronomy" (1889), the best works on their respective subjects in any language; also "Elements of Astronomy" (1890); "Lessons in Astronomy" (1891); "Uranography." He was vice-president and president of the American Association for the Advancement of Science, an associate of the American Academy of Arts and Sciences, of the Royal Astronomical Society of Great Britain, and a member of the National Academy of Sciences. He died Jan. 4, 1908.

**Young, Charles Mayne,** an English tragedian; born in London, England, Jan. 10, 1777; spent a year with an uncle at the Danish court (1786–1787); was educated at Eton and Merchant Taylors; and, driven from home with his mother and two brothers, had for a while been a clerk in a West India house, when in 1798 he made his début at Liverpool. One hiss — his father's — was mingled with the applause that greeted his first appearance in London, in 1807, as Hamlet; this, Iago and Falstaff being perhaps his best characters. "With his personal advantages and his musical voice," as Kean put it, he was a really original actor, second only, nay in some parts superior, to Kean himself. In 1829 he declined an offer of $50,000 for a 10 months' tour in the United States, and in 1832 he retired with a fortune of $300,000. He died in Southwick, near Brighton, June 28, 1856. In 1805 he had married a brilliant young actress, Julia Anne Grimani (1785–1806), who left him a son, the Rev. JULIAN CHARLES YOUNG (1806–1873). He was educated at Clapham, St. Andrews, and Worcester College, Oxford; became rector of Southwick, Sussex (1844–1850), and then of Ilmington, Worcesterhsire; and published a most amusing "Memoir of Charles Mayne Young" (2 vols. 1871), four-fifths of which is taken up with his own "Journal," and which was supplemented in 1875 by "Last Leaves" from that same jourrnal.

**Young, Clark Montgomery,** an American educator; born in Hiram, O.; was graduated at Hiram College; and after 1883 engaged in educational work in South Dakota. He was secretary of the Territorial Board of Education of Dakota, and of the State Board of Education of South Dakota; and Professor of History and Sociology in the University of South Dakota. He was author of "The State and Nation" (with Prof. George M. Smith); "History and Government of South Dakota"; "Elements of Pedagogy"; etc. Died in 1908.



**Young, Edward,** an English poet; born in Upham, near Winchester, England, in June, 1681; the son of a dean of Salisbury. He was educated at Winchester and Oxford, and obtained in 1708 a law fellowship at All Souls. Patronized and pensioned by the profligate Duke of Wharton, he wrote some poems and a couple of plays, one of which, "The Revenge," long kept possession of the stage. His first great literary success was his production of a series of satires, issued collectively in 1728 as "The Love of Fame, the Universal Passion." When nearly 50 he took orders, was made (1730) a royal chaplain and rector of Welwyn, Herts. Between 1742 and 1744 appeared the work by which chiefly he is remembered, the gloomy but striking "Night Thoughts." He died April 12, 1765.

EDWARD YOUNG.

**Young, Frederick George,** an American educator; born in Burnett, Wis., June 3, 1858; was graduated at Johns Hopkins University in 1886; took a post-graduate course in history and political science in 1886–1887; was vice-principal of the State Normal School, in Madison, S. D., in 1887–1890; principal of the Portland High School, Oregon, in 1890–1894; president of Albany College, Oregon, in 1894–1895; and became Professor of Economics and History in the University of Oregon in the latter year. He was a member of the State Constitutional Convention of South Dakota in 1889; and a member of many historical societies. He edited "Sources of the History of Oregon"; "A World Movement and a National Movement that Had Important Relations to the Making of Oregon"; "Exploration Northwestward"; etc.

**Young, Sir Frederick,** an English philanthropist, publicist, and writer of travels; born in London, June 21, 1817. He aided in securing Victoria Park, London, and Epping Forest to the public, and in establishing the People's Palace; took great interest in the emigration question; was one of the earliest advocates of imperial federation; etc. He wrote: "Long Ago and

Now"; "New Zealand: Past, Present, and Future"; "A Winter Tour in South Africa"; etc.; and edited "Imperial Federation" (1876).

**Young, James,** a British chemist; born in Glasgow, Scotland, in 1811; studied chemistry under Professor Graham at Anderson's College, Glasgow, and became assistant both there and at University College, London. Receiving appointments in chemical works at St. Helen's and Manchester, he discovered a method of distilling oil from shale, through which he became the founder of the mineral oil industry of Scotland, besides leading to the development of the petroleum industry in America and elsewhere. He acquired a large fortune, and endowed a chair of technical chemistry in Anderson's College, Glasgow. He died in 1883.

**Young, James Thomas,** an American author; born in Philadelphia, Pa., Sept. 23, 1873; was graduated at the University of Pennsylvania in 1893; and became instructor there in 1896. He wrote "Administrative Centralization in England"; and "Administrative Centralization in France," in the "Annals" of the American Academy of Political and Social Science; "A Municipal Theocracy of Municipal Affairs" (1898); "Liberty versus Efficiency" in the "Yale Review" (1899); etc.

**Young, Jesse Bowman,** an American clergyman, author, and editor; born in Berwick, Pa., July 5, 1844; was graduated at Dickinson College in 1868; served three years in the Union army in the Civil War, ending as captain in the 84th Pennsylvania Volunteers; entered the ministry of the Methodist Episcopal Church in 1868, and was pastor in Pennsylvania and Kansas City, Mo.; editor of the "Central Christian Advocate" (1892–1900); etc. He wrote: "What a Boy Saw in the Army"; "Days and Nights on the Sea"; "Helps for the Quiet Home" (1900).

**Young, John,** a British clergyman, and religious and philosophical writer. He published: "The Province of Reason" (1860); "Evil and Good" (2d ed. London, 1861); "The Life and Light of Men" (1866); "The Christ of History" (6th ed. 1870); "The Creator and the Creation" (1870).

**Young, Sir John,** Baron Lisgar, a British statesman; born in Bombay, British India, Aug. 31, 1807; was graduated at Oxford University in 1829 and called to the bar in 1834. He was a member of the House of Commons in 1831–1845; lord of the treasury in 1841–1844; secretary of the treasury in 1844–1846; chief secretary under the Earl of Aberdeen, in Ireland, in 1852–1855; and in the latter year was transferred to the Ionian Islands as lord high commissioner. On the death of his father in 1848 he succeeded to the baronetcy, and in 1860 was sent to New South Wales as governor. His administration in that colony lasted nearly seven years, when he returned to England, and in 1868 was appointed governor-general of Canada, in which office he served till 1872, when he was succeeded by the Earl of Dufferin. He died in Ireland, Oct. 6, 1876.

**Young, John Russell,** an American journalist; born in Dowington, Pa., Nov. 20, 1841. He entered journalism in 1857 as a copyholder on the Philadelphia "Press"; and was rapidly promoted to reporter, news editor, Washington correspondent, and at the outbreak of the Civil War war correspondent. He remained with the Army of the Potomac from the battle of Bull Run to the end of the Chickahominy campaign, when he returned to Philadelphia ill, and became managing editor of the "Press." In September, 1865, he joined the editorial staff of the New York "Tribune"; in May, 1866, became managing editor, retiring in 1869; established the "Morning Post" in Philadelphia; the "Standard" in New York (1869); was European correspondent of the New York "Herald" (1871–1877); as correspondent of the same paper he accompanied General Grant in his journey round the world (1877); resumed editorial work on the "Herald" (1879–1882); was appointed minister to China (1882); resigned in 1885 and came home; was appointed Librarian of Congress, June 30, 1897. He wrote "Around the World with General Grant" (1879), and edited "Memorial History of Philadelphia" and "Narrative and Critical History" (1895). He died in Washington, D. C., Jan. 17, 1899.

**Young, Mrs. Julia Evelyn,** an American verse writer and novelist; born in Buffalo, N. Y., Dec. 4, 1857. She wrote: "Adrift: A Story of Niagara"; "Glynne's Wife: A Story in Verse"; "Thistle-Down," poems; "The Story of Savilla" (1897), a poem.

**Young, Mrs. M.,** formerly Mrs. Thomas Postans; wrote as Mrs. Thomas Postans: "Cutch" (1838), sketches of Western India; "Western India in 1838" (2 vols. 1839); "Facts and Fictions Illustrative of Oriental Character" (3 vols. 1844). As Mrs. Young: "Our Camp in Turkey" (2d ed. 1855); "Aldershot, and All About It" (2d ed. 1858); "The Moslem Noble" (1857); etc.

**Young, Robert,** a Scotch Biblical scholar; born in Edinburgh, Scotland, Sept. 10, 1822; was bred a printer; superintended the Mission Press at Surat (1856–1861); thereafter devoted himself to the preparation, printing, and publishing at Edinburgh, of a long series of meritorious books of somewhat narrow but remarkable Biblical scholarship, working with unbroken industry till

his death. Among his books were an independent translation of the Bible; "Marginal Readings (10,000) for the English Testament"; "Concise Critical Comments on the Holy Bible"; "Grammatical Analysis" of the Hebrew, Chaldee, and Greek Scriptures; "Hebrew Vocabulary," and the laborious "Analytical Concordance to the Bible," giving 311,000 references, etc. He died in Edinburgh, Oct. 14, 1889.

**Young, Robert Anderson,** an American author; born in Knox co., Tenn., Jan. 23, 1824; was graduated at Washington College, Tenn., in 1844; removed to Nashville in 1846; and united with the Tennessee Conference of the Methodist Episcopal Church, South; and held pastorates in several cities in Tennessee. He was president of the Wesleyan University, Florence, Ala., in 1861–1864; financial secretary of the Board of Trustees of Vanderbilt University in 1874–1883; secretary of the Board of Missions of the Methodist Episcopal Church, South, a member of every General Conference of the Methodist Episcopal Church since 1895; and secretary of the Tennessee Conference for 21 years. He was editor of the "Advocate of Missions" and author of "Personages"; "Ariel"; "Twenty Thousand Miles"; etc. He died in 1902.

**Young, Samuel Baldwin Marks,** an American military officer; born in Pittsburg, Pa., Jan. 9, 1840; entered the Union army in 1861; served with distinction through the Civil War; and was brevetted Brigadier-General, April 9, 1865. He joined the regular army as 2d lieutenant in May, 1866; was promoted captain in July, 1866; and colonel, June 19, 1897; was commissioned a Brigadier-General of volunteers, May 4, 1898; and participated in the Cuban campaign; was promoted Major-General of volunteers, and honorably discharged after the surrender of Santiago; served in the Philippines in 1899–1901; was promoted Brigadier-General, U. S. A., Jan. 2, 1900; Major-General, Feb. 2, 1901; and for a time served as military governor of Northwestern Luzon and was commander of the 1st District, Department of Luzon. Later in the same year he commanded the Department of California. In 1902, he became president of the Army War College, in Washington, D. C.; in 1903 Lieutenant-General and Chief of Staff; in 1904 retired.

**Young, Samuel Hall,** an American clergyman; born in Butler, Pa., Sept. 12, 1847; was graduated at the University of Wooster in 1875, and at the Western Theological Seminary, Alleghany, Pa., in 1878; and ordained in the Presbyterian Church in 1878. He went to Fort Wrangel, Alaska, as a missionary and explorer in 1878; organized the First Protestant Church in Alaska in 1879; held pastorates in California, Illinois, Iowa, and Ohio; later sent to the Klondike; established the First Presbyterian Church in Dawson in 1898; and organized missions in Eagle, Romfort, Nome, and Teller. In 1901 he was appointed superintendent of all the Presbyterian missions in Alaska.

**Young, Thomas,** an English scientist; born of a Quaker family in Milverton, Somersetshire, England, June 13, 1773. He qualified himself for the medical profession; but a fortune left him made him rather languid in his practice as a physician in London. In 1802 he became the colleague of Davy as Professor of Natural Philosophy at the Royal Institution, having previously made the discovery of the interference of light, the result of researches which, completed by Fresnel, secured the triumph of the undulatory theory. In 1807 appeared his admirable "Lectures on Natural Philosophy." In 1818 he was appointed secretary of the Board of Longitude, with the charge of supervising the "Nautical Almanack." Young preceded Champollion in the discovery of the alphabetic character of certain of the Egyptian hieroglyphs. He was a man of universal accomplishments, adding to his scientific and mathematical attainments a knowledge of the classical and the principal modern and Oriental languages. He died in London, May 10, 1829.

**Young, Sir William,** an English statesman; born in the middle of the 18th century. Among his writings are: "Travels in Italy" (1772); "The Spirit of Athens: Political and Philosophical Investigations on the History of that Republic" (1777); "Rights of Englishmen" (1793); "The Black Caribs of the Island of St. Vincent" (1795); "The West Indian Common-Place Book." He died about 1815.

**Young England,** a political party in England, formed about 1844 by Mr. Disraeli, after he had begun to oppose the general policy of Sir Robert Peel. Besides its founder it contained some young men of ability and position, prominent among them being Lord John Manners, afterward Duke of Rutland; Mr. George Smythe, afterward Viscount Strangford; and Mr. Baillie-Cochrane, afterward Lord Lamington. Its program was the reconciliation of the aristocracy and the Church on the one hand, and the people on the other. Its principles were attractively expounded in Disraeli's two fictions, "Coningsby" and "Sybil."

**Young Europe.** See YOUNG ITALY.

**Young Germany,** a group of literary and political innovators in Germany, headed by Heine.

**Young Ireland,** a political party in Ireland; formed toward the close of the career of O'Connell by a knot of enthusiastic young Irishmen who were dissatisfied with his plans of constitutional agitation, and were

opposed to the conservatives. Its leaders were Charles Gavan Duffy, John Blake Dillon, Thomas Osborne Davis, John Mitchel, Thomas Francis Meagher, and William Smith O'Brien. Their resort to physical force was punished by the transportation of some of them, and gave the party its deathblow.

**Young Italy,** a movement toward forming a republic in Italy, about 1834, led by Mazzini. There were similar republican associations in other countries, called "Young France," "Young Germany," "Young Poland," etc., the whole known as "Young Europe." See MAZZINI, G.

**Young Men's Christian Associations,** organizations of young men in the different cities, demanding a profession of Christianity in their active, and good moral character in their associate members, and working by methods in harmony with Christianity for the physical, social, mental, and spiritual improvement of their members, and of young men in general. An organization called Young Men's Christian Association, was first formed in London, England, by George Williams in 1841. The movement extended to the United States and Canada in December, 1851, when societies were formed at Montreal and Boston, Mass. About 24 associations were added during the next two years, and during the next 10 years the number reached 200. At the first convention, held in Buffalo, N. Y., June 7, 1854, a confederation was formed, with a central committee, and a yearly convention. This form of affiliation continued till the Civil War. During the war the United States Christian Commission, formed in New York, in November, 1861, sent 5,000 Christian helpers to the field and the hospitals, and distributed over $5,000,000 in money and stores. Guided by the experience gained at this period, the reorganized movement grew rapidly after the war on the following lines: The evangelical test of active membership, a definite and comprehensive plan of work, the ownership of well-adapted buildings, the employment of trained and paid officers, a committee of supervision for each State or province, with a central committee for general oversight, systematic effort directed to special classes of men (*e. g.*, merchants' clerks, college students, railroad men, German speakers, colored men, Indians, lumbermen, sailors, soldiers, etc.), and great prominence given to the Bible and personal work. A typical Young Men's Association building contains a reception room, reading room, library, parlor, recreation room, offices, class rooms, lecture and entertainment room, gymnasium, including bowling alley, bath and dressing rooms, rooms for boys, kitchen, and janitor's den. Religious and moral instruction, work in behalf of personal purity temperance, etc., instruction in various branches of knowledge, practical and theoretical, social gatherings, entertainments and games, an employment bureau, boarding house register, saving's fund, medical club, and visitation of the sick, are features. There are two well-equipped training schools at Springfield, Mass., and Chicago, Ill. Of the 7,942 associations in the world in 1909, 1,939 were in North America. The total membership of these American associations was 456,927; they occupy 681 buildings of their own, valued at $46,872,630, including 784 libraries, containing 519,772 volumes. They employ 2,687 general secretaries and other paid officials.

**Young Pretender, The.** See PRETENDER.

**Youngstown,** a city of Ohio, county-seat of Mahoning co.; on the Mahoning river, and on the Pennsylvania, the Pittsburg and Lake Erie, the Lake Shore and Michigan Southern, the Baltimore and Ohio, and the Erie railroads; 67 miles E. S. E. of Cleveland. It is built on both sides of the river, has an area of about 13 square miles, and more than 130 miles of streets. Wick park, within the city, and Mill Creek and other parks just beyond its limits, are beautiful pleasure grounds. Prominent institutions are the Reuben McMillan Public Library, Baldwin Memorial Kindergarten, the Raven School, and the City and Mahoning Valley hospitals. The building of the Y. M. C. A., that of the Dollar Savings and Trust Co., the county court house, the Federal building, and others are noteworthy. The public and parochial schools furnish ample accommodations for the city's pupils. Youngstown is an important industrial center, especially in iron and steel manufactures. Others are lumber, oilcloth, roofing, cement, automobiles, leather, brass castings, etc. According to the United States Census of Manufactures of 1905, there were 119 establishments, with $42,370,660 of capital, and products valued at $48,126,885. The city is governed by a mayor, a council, treasurer, solicitor, etc., and there are various administrative boards. Youngstown was founded by John Young and others in 1796, the township being purchased from the Connecticut Land Co. It was incorporated as a city in 1848, and in 1876 became the county-seat. Pop. (1890) 33,220; (1900) 44,885; (1910) 79,066.

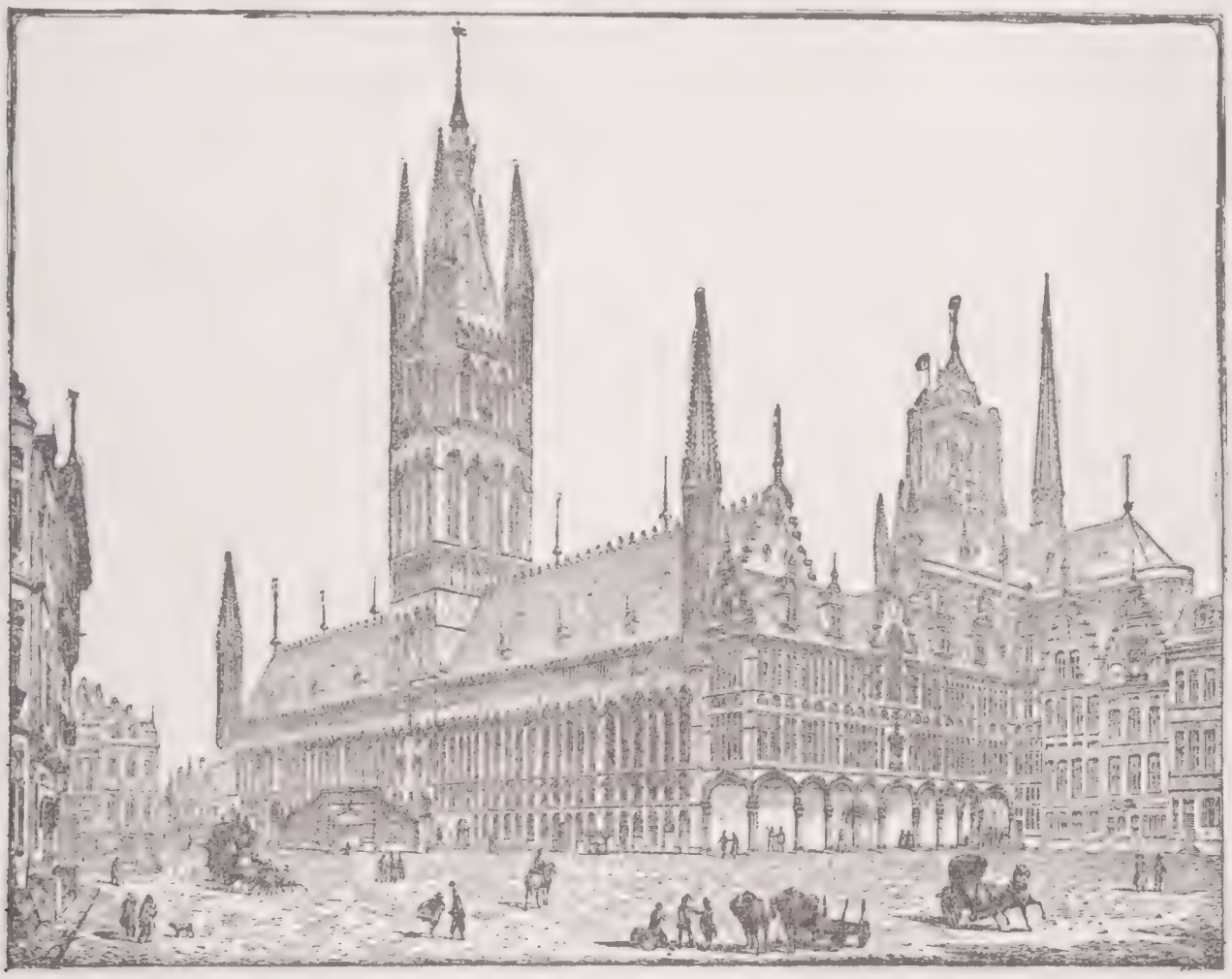
**Young Women's Christian Associations,** societies devoted to the spiritual, mental, social, and physical development of young women. The first Young Women's Association was formed in London, England, in 1855. In the United States these associations grew out of the Ladies' Christian Union of New York, established in 1858, the first Young Women's Christian Association in this country being formed in Boston, Mass., in 1866. In 1871 there were three Young Women's Christian Associations and

27 other women's associations. The associations since 1871 have held biennial conferences. There is a distinct organization of young women's Christian associations in the colleges, all sprung from the first association in the State Normal University, Normal, Ill., in November, 1872. The work in Young Women's Christian Associations was at first modeled on that of the Young Men's Christian Associations, but it was found that women's needs required that it should be different. An important feature is the maintenance of boarding homes for young women. Besides this, the associations in the large cities have gymnasiums, educational classes, entertainments, lectures, employment bureaus, etc.

The work of the associations among women is fourfold: Physical — systematic training in the gymnasium, health talks, holiday excursions, and outing clubs; social — receptions and socials in home-like rooms, boarding clubs, employment bureaus; intellectual — libraries and reading rooms, educational classes, lecture courses, concerts, library, musical, and art clubs; spiritual — Bible training classes, evangelistic meetings, personal work, Gospel meetings. In 1901 the number of associations in the United States (associations connected with the American committee) was 431; total membership, 35.000. The International Association was formed in 1886.

**Ypey, Amadeus** (ē′pī), a Dutch theological writer; born in 1760; he was Professor of Church History at Groningen. He wrote a "Literary History of Dogmatics" (5 vols. 1793–1798); "History of the Dutch Language" (1812); "History of the Dutch Church" (4 vols. 1820–1827). He died in Groningen, in 1831.

**Ypres** (ēpr) (Flemish, Y′peren), a Belgian town of West Flanders; on a fertile plain, 30 miles S. S. W. of Bruges, and 8 from the French frontier. Ypres was at one time one of the most important manufacturing towns in Flanders, the number of inhabitants in the 14th century being 200,000, and the number of looms 4,000. Its staple manufacture was DIAPER (*q. v.*). The only remnant of its once flourishing manufacture is the cloth hall (*Les Halles*),



YPRES: THE CITY HALL.

standing in the great market place, in a rich style of Gothic architecture, and surmounted by a stately square tower or belfry, with a clock and chimes. It was built 1230–1342, and restored in 1860; a part was added in 1730. There are fine frescoes in the great hall, and many statues on the outside. One of the wings is now used as the city hall. The cathedral of St. Martin is a fine Gothic edifice (1221–1350), with an altar of Carrara marble, a richly carved pulpit, and a picture doubtfully attributed to Van Eyck. The chief modern manufactures are thread and lace. Ypres is a very old town, its origin dating from the 9th and 10th centuries. In 1688 it was strongly fortified by Louis XIV., and in the great European wars was frequently subject to

sieges. Jansen was Bishop of Ypres. Pop. (1900) 16,552.

**Ypsilanti,** a city in Washtenaw co., Mich.; on the Huron river, and on the Michigan Central, and the Lake Shore and Michigan Southern railroads; 30 miles W. of Detroit. Here are the Michigan State Normal School, St. John's Academy, business college, Ladies' Public Library, electric lights, waterworks, National and savings banks, and a number of weekly newspapers. The city has manufactories of condiments, dress stays, paper, woolen goods, etc., and an assessed property valuation exceeding $4,000,000. Pop. (1890) 6,129; (1900) 7,378; (1910) 6,230.

**Ypsilanti,** a Fanariot family claiming descent from the Comneni. Its most conspicuous members are:

Alexander, born 1725, a dragoman of the Porte, hospodar of Wallachia from 1774 to 1782, and again in 1790. He was carried prisoner to Brünn in 1792. Released, he returned to Constantinople, propounded a scheme for the fusion of the Greek and Turkish people, but having incurred the suspicion of the Porte, was executed in 1805.

Constantine, his son, born in Constantinople, in 1760, early planned the freedom of Greece. His scheme was prematurely discovered, and he fled to Vienna. Pardoned by the Sultan, he was hospodar of Moldavia from 1799 till 1805, when he went to Russia, but returned to Bucharest with 20,000 men, again bent on freeing Greece. But the peace of Tilsit interrupting his plans, he returned to Russia, and died in Kiev, July 28, 1816.

Alexander, eldest son of the preceding, born in Constantinople, Dec. 12, 1792, followed his father to Russia, entered the army, and served with distinction in various campaigns. In March, 1821, he entered Moldavia, and raised the standard of revolt among the Rumanians. Russia, however, frowned on his enterprise; the natives were apathetic, and he was defeated by the Turks at Dragaschen, near Galatz, June 19, 1821. He fled to Austria, and was interned at Munkacs, in Hungary. He died in Vienna, Jan. 31, 1828.

Dimitrios, brother of the preceding, born Dec. 25, 1793, served in the Russian army, and in 1821 went to the Morea, where he played a brilliant part in the struggle. But though a brave soldier and a successful general, as his victory at Tripolitza and his splendid defense of Argos show, his influence was constantly undermined by the "native" party, who never forgot that he was a Fanariot, and therefore half a foreigner. In 1827, however, he was made Commander-in-Chief of the Greek army, but the unhandsome treatment he received from the government of Capo d'Istria compelled him to resign his post, Jan. 1, 1830. He then withdrew from public affairs, and died in Nauplia, Aug. 16, 1832.

**Yriarte, Charles Emile** (i-ri-ärt′) a French journalist, of Spanish descent; born in Paris, France, in 1832. Among his works are: "Spanish Society" (1864); "Parisian Portraits" (1865); "The Life of a Venetian Patrician in the Sixteenth Century" (1874); "Venice: Its History, Art, Industry, the City and Its Life" (1879); "Italian Sculpture in the Fifteenth Century" (1885); "Francesca da Rimini" (1882); "Cesar Borgia" (1888).

**Yriarte,** or **Iriarte, Juan de** (ē-rē-är′tā), a Spanish scholar; born in Orotava, on the island of Teneriffe, in 1702. He was chief librarian of the Royal Library; and his most important work was "Codices of the Greek MSS." (1769). He also wrote epigrams and proverbs in Latin and Spanish, and narrative poems in Latin, published in four volumes (1774). He died in Madrid, Spain, in 1771.

**Yriarte,** or **Iriarte, Tomas de,** a Spanish dramatist; born in Orotava, island of Teneriffe, in 1750. His chief works are an excellent didactic poem, "Music" (1780); and "Literary Fables" (1782), considered the best fables in the Spanish language. He also wrote the first regular comedies in Spanish, the best being "The Spoiled Child" and "The Ill-Bred Young Lady"; besides publishing Spanish translations of French plays and some of the Latin poets. He died in Madrid, Spain, in 1791.

**Ysabeau, Victor Frédéric Alexandre** (i-zä-bō′), a French agriculturist; born in Rouen, France, in 1793. Among his works are: "Gardening; or, The Art of Forming and Managing a Garden" (1854); "Elementary Lessons in Agriculture" (1857); "The Vine and Fruit Tree" (1858); "Popular Natural History of France" (1864); "Hygiene and Domestic Economy" (1870). He died in Paris, in 1873.

**Ysaye, Eugène,** a Belgian violinist; born in Liège, Belgium, July 16, 1858; studied at the Liège Conservatory; traveled extensively till his appointment as first violinist in the Brussels Conservatory; came to the United States in 1894; and appeared in Boston and New York with great success.

**Yssel,** or **Ijssel,** the name of several rivers in the Netherlands. The Nieuw Yssel, one of the principal arms of the Rhine, leaves that river below Arnheim, flows N. E. for 16 miles to Doesburg, where it receives the Oude Yssel from Westphalia, then N. E., N., and N. W., through Gelderland and Overyssel, past Zutphen and Deventer, receiving the Borkel and Schip-Beek, emptying at Kampen by many arms into the Zuyder Zee, and forming a constantly widening delta. It is one of the five main arms of

the Rhine, is 320 feet broad at Zutphen, 764 at Kampen, and 90 miles in length. The NEDER YSSEL, an arm of the Leck, which leaves that stream at Vianen, flows W. through Utrecht, at Oudewater enters Southern Holland and flows S. W. past Gouda to join the Maas, forming at its mouth the island of Ysselmonde.

**Ysselmonde,** or **Ijsselmonde** (ī'sl-mōn-duh), an island of the Netherlands, opposite the mouth of the Yssel.

**Ystad,** a seaport of Sweden, on the extreme S. coast, 55 miles E. S. E. of Copenhagen, and 85 N. N. E. of Stralsund. It has two churches, and manufactures of tobacco, chicory, sugar, soap, cloth, and leather. Ystad has a good harbor, is in regular steamboat communication with the chief Baltic ports, and is connected with the Southern Swedish railway by a branch line opened in 1866. There is considerable trade, chiefly in corn.

**Yttrium,** in chemistry, a dyad earth-metal, symbol Y, at. wt., 61.7, existing, together with erbium, as a silicate in gadolinite. It is obtained in the metallic state by digesting the mineral with hydrochloric acid, precipitating with oxalic acid, dissolving the oxalates formed in nitric acid, and separating by a series of fractional crystallizations; the erbium salt, being the less soluble of the two, crystallizing out first. On converting the nitrate into a chloride, and igniting with potassium, the metal is obtained as a blackish-gray powder, consisting of small, metallic, lustrous scales. It unites directly, at high temperatures, with chlorine, oxygen, and sulphur, and probably with other metalloids.

**Yttrium Oxide,** YO; yttria; a soft white powder, obtained by igniting the oxalate. When boiled in hydrochloric, nitric, or sulphuric acids, it dissolves slowly but completely, forming colorless salts, and, when ignited it glows with a pure white light.

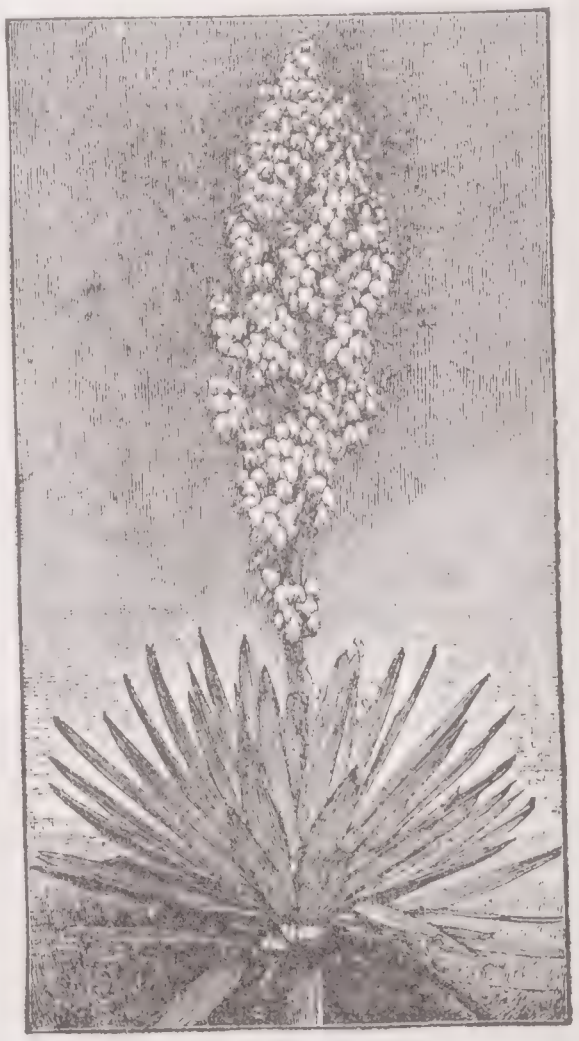
**Yttrocerite,** a native sesquifluoride of cerium, with fluoride of yttrium and fluoride of calcium (fluorspar), from Finbo, in Sweden.

**Yttrogummite,** a mineral found associated with cleveite (of which it is probably a decomposition product), near Arendal, Norway; hardness, 5.0; luster, brilliant; color black to yellow; translucent; fracture, conchoidal; composition: A hydrated oxide of yttrium and uranium.

**Yttrotantalite,** an orthorhombic mineral occurring, in crystals and massive, in felspar and quartz, at Ytterby and Fahlun, Sweden; hardness, 5–5.5; sp. gr., 5.4–5.9; luster, vitreous to greasy; color, black, brown, shades of yellow: opaque to subtranslucent; fracture, conchoidal; composition: A tantalate of yttria and lime, with sometimes iron and protoxide of uranium, a mean of several analyses yielding tantalic acid, 62.5; yttria, 22.6; lime, 5.2; protoxide of iron, 3.4; protoxide of uranium, 6.3 = 100, which corresponds to the formula $10(YO,FeO,CaO,UO)3TaO_5$.

**Yucatan** (yö-kä-tän'), a peninsula forming the S. E. extremity of Mexico. Before its conquest by the Spaniards it was the seat of a flourishing civilization. It is now for the most part a sparsely cultivated region, whose forests yield excellent timber, cabinet woods, and dye woods, and which has recently been productive of great quantities of sisal or so-called Yucatan hemp. Five-sixths of the inhabitants are Indians, preserving the speech of their ancestors, whom the Spaniards dispossessed. In 1861 the peninsula, which since 1824 had formed one State in the Mexican Confederation, was divided into two: Yucatan and Campeche. Yucatan has an area of 35,203 square miles and a pop. (1900) of 314,087. Capital, Merida; pop. 43,630. Campeche has an area of 18,087 square miles and a pop. (1900) of 86,542. Capital, Campeche; pop. estimated at 18,730.

**Yucca,** Adam's needle; a liliaceous genus doubtfully placed under *Tulipeæ*. Evergreen shrubs, their stem tending to arborescence,



YUCCA, OR ADAM'S NEEDLE.

crowned by a circle of linear, lanceolate, rigid leaves, from the center of which rises a large panicle of snow-white, whitish-green, or cream-colored flowers. Perianth bell-

shaped, its segments without nectaries; stamens clavate, style wanting, fruit capsular, hexagonal, with three cells and numerous flat seeds. From the hotter parts of America. *Y. gloriosa,* common Adam's needle, has an upright stem, a panicle of flowers three feet long, and a total height in America of 10 or 12 feet, though the cultivated plant in Great Britain is very much smaller. It is a native of the United States from Carolina to Mexico and Texas. Its fruit is purgative; its stem yields starch and also a fiber well adapted for paper making. *Y. angustifolia* and *Y. filamentosa* have also fibers which may be similarly used. The last-named species, called the silk grass, has panicles of pendulous cream-colored flowers. It grows in British gardens, blossoming in the autumn.

**Yucca Fiber,** a coarse, fibrous material obtained from the leaves of certain plants of the yucca family, and which is chiefly used by the Indians in making cordage, mats, etc. A kind of starch is also made from the stems of one species of yucca found in New Granada.

**Yuen.** See WOOYEN.

**Yuga,** or **Yooga,** in Hindu chronology, one of the periods into which the past history of the globe may be divided. There are four yugas: The Satya Yuga, containing 1,728,000 years; the Treta Yuga, 1,296,000; the Dwapara Yuga, 864,000 years; and the Kali Yuga, now in progress, began about 3094 B. C., and which will extend to 432,000 years. Horace Hayman Wilson points out that these numbers originate in the descending arithmetical progressions of 4, 3, 2, 1, according to the notions of diminishing virtue in several ages applied to a cycle of 12,000 divine years, each equal to 360 years of mortals; and $12,000 \times 360$ is $=$ 4,320,000, the periods of the four yugas added together.

**Yukon,** the largest stream in the extreme N. W. portion of the North American continent. It is 2,044 miles in length, the Mackenzie river, near it, being estimated at 2,000 miles. It is the 17th river of the world as to length, the seventh of the Western Hemisphere, the fourth of the North American continent, and the third in the United States. This last assertion is based on its whole length of 2,044 miles, however, but taking only that portion which is in the United States, or Alaska, 1,260 miles, it is the fifth river of our country, the Mississippi, Missouri, Arkansas, and Ohio rivers being longer. Its length in navigable miles is 2,036, there being but four rivers in the world with a greater capacity, the Amazon, the Mississippi, the Missouri, and the St. Lawrence. The entire portion lying in the United States (Alaska) of 1,260 miles is navigable by river steamers. The first absolutely impracticable obstruction to navigation is at the Grand Cañon, 1,866 miles from the mouth. The Yukon river rises in Crater Lake, on the E. slopes of the Alaskan coast range (here called Kotusk Mountains), in British Columbia. In a few miles it passes into the British Northwest Territory, flows N. by W. 784 miles, and enters Alaska about lat. 65° N. This direction is kept till the Arctic circle is just reached, when the Yukon river bends suddenly at almost right angles, flows W. by S. about 1,000 miles, and empties into Bering Sea by a delta whose N. and S. mouths are from 80 to 90 miles apart.

**Yukon,** a territory in N. W. British America; formerly a district of the Northwest Territories; created a separate territory in 1898. It lies in the W. portion, and just N. of British Columbia. It was brought into prominence by the discovery in 1897 of immense quantities of gold on the Klondike river and its tributaries. The gold-producing region extends about 80 miles N. and S., and is perhaps 50 miles in width. See KLONDIKE.

**Yule,** the old English name for Christmas, still used provincially, as well as in Yule log, Yule cake, Yule tide. For the nature of the old heathen festival, and the way in which the observances were overlaid or transformed by the Christian institution, see CHRISTMAS.

**Yule, Sir Henry,** a British Orientalist; born near Edinburgh, Scotland, in May, 1820. Having entered the Indian army he served in the Sutlej campaign (1845–1846), in the Punjab (1848–1849), in Burma, and in the Indian mutiny, and became secretary to the Public Works Department, in which capacity he took part in several important surveys and missions. In 1875 he was appointed a member of the Home Council of India. Of the many works which he wrote and edited, the most noted is his admirable translation, with notes and maps, of Marco Polo (1871; augmented edition, 1875). He edited several volumes for the Hakluyt Society; and was a gold medallist of the Royal Geographical Society. He died in London, England, Dec. 30, 1889.

**Yuma, The,** a river in Haiti, which rises in the mountains of Cibao and falls into the Atlantic by a broad estuary; length, 70 miles.

**Yung Wing,** a Chinese diplomatist; born in Nau Ping, China, Nov. 17, 1828; came to the United States in 1847; was graduated at Yale College in 1854; and in 1864 was commissioned by the Chinese government to buy machinery in the United States for the arsenal of Kiang-Nau. In 1870 he proposed to the Chinese government the settlement of claims for the massacre of Christians at Tientsin by establishing a line of steamers

to carry a tribute of rice, the outgrowth of which was the celebrated China Merchant Steam Navigation Company. He was also influential in persuading the Chinese government to provide for the education of Chinese youth in foreign countries, that intercourse with foreigners might be made easier. In 1875 he married Miss Mary Kellog of Hartford, Conn., an act which met with disfavor with the Chinese authorities and led to his recall. In 1878, however, he was appointed assistant minister of China to the United States, where he remained till the outbreak of the Chino-Japanese War, when he was ordered to China. At the close of the war he was appointed one of the peace commissioners, but on the refusal of the Japanese to recognize him because of his rank he was replaced by Chang-Ten-Hoon. Subsequently he was raised in rank and in 1897 represented the Chinese government at Queen Victoria's jubilee.

**Yunnan** (-nän′), the extreme S. W. province of China; bounded on the S. by Annam, Siam, and Burma; on the W. by Burma; area, 107,969 square miles; pop. 11,721,576. It is extremely rich in minerals, especially iron and copper, containing also many varieties of precious stones. At least a third of the cultivated land is said to be under the poppy. The inhabitants are for the most part Chinese; but there is a large number of non-Chinese Mohammedans (called by the Burmese Panthays).

The chief imports into Yunnan are raw cotton, cotton yarn, and piece goods; opium and tin are the chief exports. In 1869 the Mohammedans rose in rebellion against the Chinese government, and succeeded in establishing an independent government, but it lasted only three or four years. By the convention of Chefoo in 1876 the establishment of commercial relations between British subjects and Yunnan was conceded by the Chinese government.

In 1897 an agreement was made between Great Britain and China, supplementing the Frontier Convention of March, 1894, which laid down a boundary between Burma with its dependencies and Yunnan, and made arrangements for trade, extradition, etc. The question of access to Yunnan and Szechuen is one of great importance to the commercial nations of Europe. The shortest route to Yunnan is through French territory by the Red river. There are competing routes through Burma. A part of Yunnan is most easily reached from Bhamo. The Indian railway system is being extended to Kunlong Ferry, on the Salween, from which a route to Talifu, and possibly on to Szechuen, may be found practicable. Another route for a railway has been suggested through Chiengmai and Northern Siam. More important routes at present are by river up the Canton or West river, or by the Yang-tze-kiang. By the agreement of Jan. 15, 1896, Great Britain and France agreed to share equally all privileges or advantages that might be conceded by China in the provinces of Yunnan and Szechuen.

YUNNAN, the capital, is in the S. E., and is a busy and prosperous town, with large copper factories, and manufactures of silks and carpets. Pop. 200,000.

**Yunx,** or **Iunx,** a genus of *Picidæ* (sometimes raised to the rank of a family, *Yungidæ*), with five species, characteristic of the Palæarctic region, but extending into North and East Africa, over the greater part of India (but not to Ceylon), and just reaching the lower ranges of the Himalayas. There is also one species isolated in South Africa. Beak shorter than head, hard, straight, nearly conical, sharp at tip; nostrils basal, linear, closed by a membrane; tongue protrusile, with smooth, horny tip; wings moderate, tail somewhat rounded; tarsi strong, slightly feathered in front above; two toes before and two behind; claws much hooked, grooved, and very sharp. The name of the genus should probably be iunx, but the misspelling of Linnæus has been followed by the majority of authors, though now there is a tendency to revert to the correct spelling.

**Yusuf,** or **Yussuf, Abu Amru** (yös′öf), an Arabic historian; born in Cordova, in 976. He was profoundly versed in the traditions of the Oriental Mussulman countries. He wrote: "Behedjet-Almodjalisyn," a collection of tales about Mahomet, etc.; "Tamhyd," a commentary on one of the chief Mussulman works of religious and civil law; "History of the Opinions and Doctrines of the Principal Mussulman Sects"; "History of the Wars Against the Christians"; etc. He died in Xativa, in 1070.

**Yuthia,** or **Ayodhya,** the former capital of Siam; 40 miles N. of Bangkok; is almost encircled by the Méinan, whose fisheries furnish the town its principal employment. The German Mandelslohe in the 15th, and Portuguese Mendez Pinto in the 16th centuries, described the marvels of this "Venice of the East"; but in 1768 it was razed to the ground by the King of Ava, and of its famous structures there only remains the "Golden Mountain," a neighboring pyramid 400 feet high, with a gilded colossal statue of Buddha. The modern town is the summer residence of many Bangkok merchants, and has an estimated population of 40,000, including many Chinese and Burmese.

**Yvan, Melchior** (ē-von*g*′), a French physician and publicist; born in Digne, Basses-Alpes, France, in 1803. He wrote: "China and the Malay Peninsula" (1850); "Travels and Stories" (1852); "The Insurrection in China" (1853); "From

France to China" (1855). He died in Nice, in 1873.

**Yverdon** (ē-vār-dông′), or **Yverdun,** a pleasant Swiss town of 6,300 inhabitants in the Canton de Vaud; at the S. end of the Lake of Neufchâtel; 20 miles N. of Lausanne. The old castle, built in 1135, was used by PESTALOZZI (*q. v.*) as an educational institute; and is now occupied by municipal schools, a library, and museum. There is a sulphur bath less than a mile out of the town.

**Yvert, Eugène** (ē-vār′), a French journalist; born in Marly-le-Roi, France, in 1794. He was editor of the "Picardy Gazette," 1831. He wrote: "Parliamentary Sketches" (1832), in verse; "Political Customs" (1845); "A Ghost" (1852), a two-act comedy in verse; "Poetic Fancies" (1857); "Poetical Miscellanies" (1860); etc. He died in Amiens, Feb. 23, 1878.

**Yves d'Evreux Pierre** ēv dā-vruh′), a French-Brazilian historian; born in Evreux, Normandy, France, about 1577. He was a Capuchin missionary at Maranhao, Brazil, in 1612–1614. He wrote: "History of the Most Memorable Things that Happened at Maranhao in the Years 1613 and 1614" (Paris, 1615; 2d. ed. 1864), a continuation of the history of Claude d'Abbeville; it is a work of great historical value. He died after 1620.

**Yvetot** (ēv-tō′), an old town of France; in the department of Seine-Inférieure; 24 miles N. W. of Rouen. There are manufactures of linen, cotton, calico, and a trade in cattle and agricultural produce. The court and jail occupy the site of a Bernardine monastery (1650–1781). Pop. 7,007. The town and territory of Yvetot was long a semi-sovereign principality, and the Lord of Yvetot was popularly styled "King of Yvetot." This singular dignity was formally abrogated in 1681, but the people of Yvetot retained some privileges till the Revolution. Pop. (1901), commune, 7,352. Beranger's well-known song, "The King of Yvetot" (1812), translated by Thackeray, was a satire on Napoleon.

**Yvon, Claude** (ē-vông′), a French theologian; born in Mamers, France, in 1714. He wrote "Letters to Rousseau" (1763), in answer to Rousseau's letters to the Archbishop of Paris; earlier in life he had been associated with Diderot and the encyclopedists, and wrote "Liberty of Conscience" (1754), in which he held that the State should be indifferent in matters of religion. Other works are "Agreement of Philosophy and Religion" (1776), and "Philosophical History of Religion" (1779). He died in Paris, in 1791.

# Z

**z,** the last letter of the English alphabet, a sibilant consonant, and mere vocal or sonant s, having exactly the same sound as s in please, ease, wise, etc. The words in modern English which begin with z are all derived from other languages, principally from Greek. It was not known in the oldest English. When not initial, it frequently represents an older s, as dizzy = Anglo-Saxon *dysig*, freeze = Anglo-Saxon *freosan*, etc. It also stands for a French c or s, as in nazard, lizard, buzzard, seize. Z has intruded into citizen = French *citoyen;* and it has changed into g in ginger = Latin *zingiberi.* As a final it occurs in some onomatopoetic words, as in buzz, whizz, etc. In German it is very common, being a double consonant with the sound of ts; and similarly in Greek it was also a double consonant, representing the sound of ds or sd. In Great Britain it is called zed; in the United States zed, or zee.

**Zaandam,** or **Saardam,** a town in the province of North Holland; on the Zaan, at its entrance into the Y, 5 miles N. W. of Amsterdam. Many of its wooden houses, mostly painted white or green, are separated by canals, and with their gardens round them look like little islands. It has many corn, oil, and saw mills, in whose products an active trade is maintained with the Baltic, Black, and White Seas; and also manufactures of paper, dyes, starch, tobacco, and glue, rope spinning, and iron founding. Pop. (1905) 23,773.

**Zabel, Eugen** (tsä'bel), a German miscellaneous writer; born in Königsberg, Prussia, Dec. 23, 1851. During his extensive travels he formed the acquaintance of nearly all the literary celebrities of Europe. Among his works are: "Berthold Auerbach" (1882); "Ivan Turgenef" (1883); "Italian Dramatic Art in Germany" (1892); "Anton Rubinstein: An Artist's Life" (1892); translations of several of Turgenef's novels, and of French and Spanish dramas; some novels, among them "Parted Hearts" (1888); and several comedies, as "The Midnight Sun," and "A Missed Vocation."

**Zabern,** the name of three German towns. (1) ELSASS-ZABERN (French, Saverne), a town of Elsass, on the Zorn, 27 miles N. W. of Strassburg. A Gothic Hauptkirche of the 15th century, a castle built in 1667, but now a barrack, and a museum with a collection of local antiquities, are the principal buildings. The Rhine and Maine canal passes through the town. Tanneries, potteries, and woolen mills are the chief industrial establishments, and there is considerable timber trade. The town stands at the mouth of the Zabern Pass, leading across the Vosges Mountains. The Roman Tabernæ, this town still contains traces of Roman occupation. It was long an ecclesiastical city belonging to the bishops of Metz, and an episcopal palace occupied the site of its present castle. Always a German town, though held for a time by France, it receded to Germany in 1871, and the castle, formerly occupied by the widows of members of the Legion of Honor, was employed as a barrack. (2) BROG-ZABERN, a town of Rhine Bavaria, on the Erlenbach, 8 miles S. of Landau. (3) RHEIN-ZABERN, a town of Bavaria, on the Erlenbach. The French here defeated the Austrians, July 29, 1793.

**Zaborowski-Moindron** (zä-bō-rov-ski'-mwa*ng*-drô*ng'*), **Sigismond,** a French anthropologist; born in La Crèche, France, in 1851. He was secretary of the Paris Anthropological Society, and scientific editor of several Paris journals. He wrote: "On the Antiquity of Man" (2 vols. 1874); "Prehistoric Man" (1878); "Origin of Language" (1879); "Scientific News and Curiosities" (1883); "Worlds that Have Disappeared" (1884).

**Zacatecas,** capital of a State of the same name in Mexico; is a famous silver mining town, in a deep ravine; 440 miles N. W. of Mexico City. The streets are narrow and irregular, but there are numerous squares, and a market place. Zacatecas is the great silver producing State of Mexico. The mines since 1540 have yielded over $1,000,000,000. Pop. of the city (1900) 32,856.

**Zaccone, Pierre** (zä-ko*ng'*), a French dramatic author; born in Douai, France, April 2, 1817. Early in life he entered the postoffice service at Brest, but devoted all

his leisure to literature, and was befriended by Émile Souvestre. He published: "Tableaux of Universal Literary History" (1844); "Memoirs of a King" (1851); "New Paris" (1856); "The Daughter of Heaven" (1857); "The Dramas of the Catacombs" (1864); "Condemned to Death" (1866); "The Red Lantern" (1873); "The Man of the Multitude" (1877); "The Man with Nine Millions" (1882); "The Black Envelope" (1891); "Clotide's Secret" (1893); etc. Among his plays, mostly written in collaboration with others, are: "The Twenty-fourth of February" (1848); "Cousin Verdure" (1855); "The Sundays of Pampette." He died May 6, 1895.

**Zachariä, Heinrich Albert** (tsä-chärē'ä), a German publicist; born in Herbsleben, Saxe-Gotha, Nov. 20, 1806. He was professor in the University of Göttingen. Among his works are: "German States' Rights and Federal Rights" (1841); "Manual of German Criminal Procedure" (1860); "German Constitutional Laws of the Present Time" (1855); "The Question of the Competence of the Empire in View of the Dogma of Infallibility" (1871). He died in Kannstadt, Germany, April 29, 1875.

**Zachariä, Just Friedrich Wilhelm,** a German poet; born in Frankenhausen, Germany, May 1, 1726. He was Professor of Belles-Lettres in the Carolinum, Brunswick (1761). He wrote: "The Brawler" (1744), the first burlesque heroic poem that had appeared in German; "Phaeton"; "The Handkerchief"; "Murner in Hell" (1757); "Fables and Tales" (1771); etc.; and translated into German hexameters Milton's "Paradise Lost" (1760). ("Poetical Works," 9 vols. 1763-1765, posthumous writings, with biography, 1781). He died in Brunswick, Germany, Jan. 30, 1777.

**Zachariä von Lingenthal, Karl Eduard** (tsä-chä-rē'ä fon ling'en-täl), a German writer on jurisprudence; born in Heidelberg, Germany, Dec. 21, 1812. He is regarded as the founder of the science of Græco-Roman jurisprudence. He wrote "Outline of a History of Græco-Roman Jurisprudence" (1839), "History of Græco-Roman Private Right" (1864); made a collection of "Græco-Roman Laws" (1856-1884); and edited Justinian's "Novellæ" (1881). He died in Grosskmehlen, near Merseburg, Germany, June 3, 1894.

**Zachariä von Lingenthal, Karl Salomo,** a German jurist; born in Meissen, Saxony, Sept. 14, 1769. He was Professor of Law at Wittenberg, 1797–1807, and Heidelberg, 1807–1843. He wrote: "The Unity of State and Church" (1797); "Forty Books on the State" (2d ed. 7 vols. 1839–1843); "Hand-Book of French Civil Law" (8th ed. 1894–1895); etc. He died March 27, 1843.

**Zacharias,** father of St. John the Baptist, and husband of St. Elizabeth. He was a priest of the temple of Jerusalem, and became dumb on refusing to believe the announcement, made by the angel Gabriel, that a son should be born unto him; but recovered his speech at the birth of St. John the Baptist. He is believed to have been put to death by Herod.

**Zacharias.** See ZECHARIAH.

**Zacharias,** also known as ZACHARY, Pope from 741 to 752; a Greek by birth. He gave his consent to the setting aside of the Merovingian Childeric III. and the elevation of Pepin the Short to the French throne (752). He died in Rome, March 14, 752.

**Zachariasiewicz, Jan** (tsä-cha-ri-äs'yāvich), a Polish author; born in East Galicia, about 1825. At various times he became involved in political difficulties, and passed several years in prison; and these experiences have colored all his books. His first publication was "A Passage from the Life of Unknown People" (1853). In "The Red Cap" and "The Secret Fund," he describes the spy system of the police force; and of like nature are "Covered Cards" (1875), "A Bad Business" (1876), etc. He wrote also a few art novels.

**Zacher, Ernst Julius August** (tsä'*her*), a German antiquary; born in Obernigk, Prussia, Feb. 15, 1816. He was Professor of German Philology in Halle. His principal works are: "Ulfilas's Gothic Alphabet and the Runic Alphabet" (1855); "German Proverbs" (1852); "History of the Palgravine Genoveva" (1860); "Pseudo-Callisthenes" (1867), dealing with the Alexander myth. He died in Halle, Germany, March 23, 1887.

**Zacynthus.** See ZANTE.

**Zadar.** See ZARA.

**Zafarani Islands,** three small islands occupied by Spain off the N. coast of Morocco.

**Zaffre,** or **Zaffar,** in chemistry, an impure basic arsenate of cobalt, prepared by roasting speiss cobalt. It is employed in painting on glass and porcelain, for which purpose it must be free from iron. See COBALT.

**Zahm, John Augustus,** an American educator; born in New Lexington, Perry co., O., June 14, 1851; was graduated at Notre Dame University in 1871; entered the Order of the Holy Cross in the same year; had charge of the scientific department of Notre Dame University in 1874, was director in 1875, and vice-principal and director of studies in 1876; was curator of the University Museum for many years; and became provincial of the Order of the Holy Cross in

1897. He lectured extensively, and was well known as an advanced evolutionist. His publications include "Evolution and Dogma"; "Sound and Music" "Catholic Science and Catholic Scientists"; "Scientific Theory and Catholic Doctrine"; "Science and the Church"; etc.

**Zahn, Johann Karl Wilhelm** (tsän), a German architect; born in Rodenberg, Schaumburg, Germany, Aug. 21, 1800. He became professor in the Academy of Arts, Berlin, 1829. Among his works were: "The Most Beautiful Ornaments and the Most Notable Pictures from Pompeii, Herculaneum, and Stabiæ" (1828–1830); "Ornaments of All Classical Periods of Art" (1832–1839); etc. He died in Berlin, Aug. 22, 1871.

**Zahn, Theodor,** a German theologian; born in Mörs, Prussia, Oct. 10, 1838. He was appointed Professor of Theology in the University of Erlangen in 1878, and wrote "Marcellus of Ancyra" (1867); "The Shepherd of Hermas" (1868); "Ignatius of Antioch" (1873); "The Acts of St. John" (1880); "Cyprian of Antioch and the German Story of Faust" (1882); "Researches Into the History of the New Testament Canon" (5 vols. 1881–1893); "The Gospel of Peter" (1893); "Introduction to the New Testament" (1897).

**Zähringen,** the house from which the present grand-ducal family of Baden takes its origin. The name is derived from the ruined castle of Zähringen, in a village of the same name, 2 miles N. of Freiburg in Baden. The first founders of the family were from the 8th to the 10 century Counts of Breisgau, but the authenticated history of the house really begins with Bertold I., "the Bearded," who became duke in 1050, was much esteemed by the Emperor Heinrich III., and received from him the reversion of the duchy of Swabia. He was, however, passed over in 1057 by Agnes, the widow of Heinrich III., in favor of Rudolf of Rheinfelden, and received in 1061 as compensation the duchy of Kärnthen with the march of Verona. He became reconciled with Rudolf in 1070, and fought by his side at Melrichstadt, Aug. 7, 1078. When he saw from Lintburg the devastation of his lands by Heinrich IV. he became insane, and died soon after — Nov. 8, 1078. His elder son, Hermann, had died in 1074, leaving a son, Hermann II., who married Judith of Baden, and from whom the present house of Baden is directly descended. The younger son of Bertold "the Bearded," Bertold II., Duke of Zähringen (died 1111), inherited the dominions of his father-in-law, Rudolf of Swabia, and was followed by Bertold III. (fell at Molsheim, March 3, 1122), the founder of Freiburg. His brother and successor Konrad, who founded Münster, was made in 1127 by the Emperor Lothar, "Rektor" of Burgundy, where his son Bertold IV. (died 1186) and his grandson Bertold V., the founder of Bern (1191), received rich possessions. As Bertold V. died childless (Feb. 18, 1218), his dominions fell to the nearest heirs, the Dukes of Teck, who sprang from a brother of Bertold IV., and the elder Baden line. His Swabian possessions fell to his sister Agnes, the wife of the Graf von Urach, and his Swiss lands mostly to his younger sister Anna, wife of the Graf von Kiburg. The remainder, including the towns Zürich, Bern, Solothurn, and Offenburg, fell by testament to the emperor.

**Zaire,** a name given to the great African river Kongo in part of its lower course. Henry M. Stanley descended the river from Nyangwé, in lat. 4° 25′ S., where it is called the Lualaba, almost to its mouth, the journey extending from Nov. 5, 1876, to Aug. 11, 1877. The identity of the Lualaba with the Kongo being thus established, the river is found to have its origin in Lake Bangdeolo, whence it issues as the Luapula, and flows into Lake Moreo, on emerging from which it is called the Lualaba. Frequent cataracts bar its channel, though the stream is 2,000 yards broad, till in lat. 2° N., the river which had hitherto flowed N., turns N. W., subsequently W., and finally S. W., its width increasing to from 5 to 10 miles, except on occasional gorges, while its bosom is studded with great numbers of islands. About 400 miles from the sea there commences a series of 62 cataracts, by which the stream descends 585 feet in 180 miles, and below these are the Yellala Falls. The affluents of the Kongo are of great size, especially on the left or S. bank, the chief of these being the Rumani, Sankorra, Kassai, and Kwango. The Kassai rivals the main stream itself in volume, and their waters do not commingle for 130 miles. On the right bank of the chief tributaries are the Aruwimi (supposed to be the Welle of Schweinfurth), Mangola, and Mpaha. From the point where it emerges from Lake Bangweolo the total length of the Kongo is estimated at about 2,350 miles. It flows through a rich and thickly-peopled country.

**Zalacca,** a genus of pinnated calameæ; stemless palms with spines on the sheathing petioles; diœcious flowers with many spathes; the males in pairs, and the female solitary, both surrounded by bracts; fruit armed with overlapping scales, with two or three seeds encased in a fleshy covering. Species, six or seven, natives of Burma, Assam, Malacca, etc., where they grow in moist places in dense masses, constituting nearly inpenetrable thickets. The pulpy covering of the seeds is eaten by the Burmese, and the plant, in consequence, is sometimes cultivated.

**Zaleski, Bohdan** (zä-les′ski), a Polish poet; born in Bohaterka in the Ukraine, in

1802. He passed his childhood in immediate intercourse with the Cossacks, but afterward studied at Warsaw. After the revolution of 1830, he was obliged to leave Poland, and went to France. Many of his poems depict in vivid colors the scenery of his native country. His chief works are: "The Spirit of the Steppes" (1842); "The Most Holy Family"; and collections of shorter poems. He died near Paris, in 1886.

**Zaleucus,** the legendary lawgiver (about 750 B. C.) to the Epizephyrian Locrians, the Greeks who colonized the S. W. extremity of Italy. His code comprised the first written laws of the Greeks.

**Zalewski, Casimir** (zä-lev'ski), a Polish author; born in Plock, Poland, 1848. He abandoned law for literature, and founded the journal "Wick" (1805). Among his successful dramas are: "Dowerless" (1868), "As the World Moves" (1873), "Before the Wedding" (1876), "Poor Seed" (1877); the tragedies "Marco Foscarini" (1878), "Article 264," etc.

**Zalinski, Edmund Louis Gray,** an American military officer; born in Kurnick, Prussian Poland, Dec. 13, 1849; came to the United States in 1853 and entered the army at the age of 15 as a volunteer aide-de-camp on the staff of General Miles. He received a commission in the United States army in 1866, was promoted 1st lieutenant of artillery in 1867 and captain in 1887. From 1872 to 1876 he was Professor of Military Science at the Massachusetts Institute of Technology; was graduated at the Artillery School, Fort Monroe, in 1880, and at the School of Submarine Mining, Willet's Point, several months later. In 1889 he was sent to St. Petersburg as military attaché to the American legation, remaining on duty for a year. He retired from active service in 1894. He wrote: "Notes on Telescopic Sights for Cannon"; "Deflection of Projectiles by Wind"; etc. He was the inventor of the pneumatic dynamite torpedo gun which bears his name, the electrical fuse, an intrenching tool, a ramrod bayonet, a telescopic sight for artillery, etc. He died March 10, 1909. See DYNAMITE GUN.

**Zalokostas, Georgios** (zäl-ō-kōs'tas), a modern Greek poet; born in Syrrhako, Epirus, April 17, 1805. At the age of 16 he fought in the insurrection at Missolonghi. The Greek children learn his songs. Among his best-known poems were: "Missolonghi"; "Armatoles and Klepts"; "The Entrance of Prevesa"; "Hours of Leisure"; "Marco Bozzaris"; etc. Several of his pieces have been translated into Italian, Spanish, English, German, French, and Russian. ("Poetical Works," Athens, 1860.) He died in Athens, Sept. 3, 1858.

**Zaluski, Josef Andrezej** (zä-lös'kē), a Polish scholar; born in Poland in 1702. He was Bishop of Kiev and was banished for his opposition to the Dissidents. He awakened Polish literature at the time of the downfall of the nation, and spent his fortune in collecting a great library, which he bequeathed to Poland, but which was taken by Russia after the partition, and formed the nucleus of the Imperial Public Library. He died Jan. 9, 1774.

**Zama** (near Carthage, North Africa), the scene of the battle between the two greatest commanders in the world at the time, Hannibal and Scipio Africanus. The victory was won by Scipio, and was decisive of the fate of Carthage, 202 B. C. It led to an ignominious peace, which closed the Second Punic War, 201 B. C. The Romans lost about 2,000 killed and wounded, while the Carthaginians lost in killed and prisoners more than 40,000; some historians make the loss greater.

**Zamacois, Eduardo** (thä-mä-ko'ēs), a Spanish painter; born in Bilboa, Spain, in 1842. He was a pupil of Madrazo and Meissonier, and also studied art in Rome and Florence. Among his paintings are: "The Hunchback"; "Spanish Recruits"; "The Bull Fighters"; "Indirect Taxes"; "A Court Jester of the 16th Century"; "The King's Favorite" (1867); "Cervantes as a Recruit"; "The Rival Confessors" (1868); "Return to the Convent" (1869); "The Education of a Prince" (1870). A number of his pictures are owned in the United States. He died in Madrid, Jan. 14, 1871.

**Zambesi** (zam-bē'zē), the most important river in Southeastern Africa, and the largest flowing into the Indian Ocean. It has its source in several streams uniting in the far interior. It flows first S. E. and then N. E., then curves again to the S. E., and reaches the Indian Ocean by several mouths in the Mozambique Channel opposite Madagascar. The delta of the Zambesi covers an area of about 25,000 square miles, and commences about 90 miles from the coast, a little below the confluence of the main stream with the Shiré. The course of the whole river is about 1,400 miles, and it drains an area of 600,000 square miles. Its basin is separated from that of the Orange river on the S. W. by a slight watershed, and from that of the Limpopo on the S. by a mountain range. Its course as a whole is through fertile valleys and wooded plains; but the navigation is interrupted by rapids and cataracts, among the latter being the Victoria Falls, which are among the grandest in the world. The valley of the Zambesi is capable of immense development in the way of trade. The Portuguese government has long exercised sway for 300 miles from the mouths

of the river, and by the international arrangement of June, 1891, the river from the coast to the confluence of the Loangwe is recognized as being in Portuguese territory; the upper course is chiefly in British territory. The Zambesi and its affluents are now free to the flags of all nations.

**Zambesia,** one of the smaller districts of Portuguese East Africa. The name has also been popularly given to that portion of the territory watered by the river Zambesi, which is now under British protection; the region N. of the river being officially known as the British Central Africa Protectorate and Northern Rhodesia, and the region S., as Southern Rhodesia. See RHODESIA.

**Zamboni's Pile,** a dry voltaic pile or battery invented by Zamboni. Paper silvered on one side is damped and coated on the other with manganese dioxide; half a dozen of these sheets being superposed to save time, disks are punched out, and 1,000 to 2,000 single sheets are compressed in a glass tube with metal caps and knobs at the ends. Such a pile retains its activity for years, and will charge a Leyden jar, though it will not give shocks or sparks.

**Zamia,** in botany, a genus of *Cycadaceæ;* trees of moderate size, with trunk, the woody tissue of which has its tubes marked by circular disks. The stem is terminated above by a single bud, which ultimately opens into a circle of leaves, usually thick, and pinnatifid with spiny margins. The vernation is gyrate. The flowers, which are diœcious, are in tesselated catkins; the males having abrupt scales, with the oval anthers sessile beneath them; the females with peltate scales, each with two seeds. The fruit is drupaceous. In aspect the species partly resemble palms, and partly tree ferns; in affinity they are nearer the latter than the former, but rise considerably above them in organization. They are natives of tropical America, tropical Asia, the Cape of Good Hope, and Australia. *Z. caffra* is the bread tree Zamia. It is six or seven feet high, and is a native of Southeastern Africa, where the Kaffirs and the Hottentots make cakes of the pith after it has putrefied. *Z. spiralis* has many smooth leaflets, with a few spines at the tip. It grows in Australia, where the natives eat the fruit. The stems of *Z. tenuis* and Z. *furfuracea,* and the seeds of *Z. pumila,* in the West Indies, yield arrowroot.

**Zamiostrobus,** a genus of fossil fruits from Mesozoic and Tertiary rocks. They are generally believed to be the cones of fossil zamias. The cycads, of which *Zamia spiralis* of Australia is a familiar example, have also been associated with *Zamiostrobus.*

**Zamora,** a very ancient town of Spain; capital of the province of the same name; on the Douro, 150 miles N. W. of Madrid. It is the see of a bishop suffragan of Santiago. Zamora was of great importance in the Moorish times, was strongly fortified, and has many interesting remains of mediæval architecture. The cathedral is a late Romanesque edifice. There are some linen and woolen manufactures. It has never recovered from the devastations of the French (1808–1809).

**Zamora, Antonio de** (thä-mō′rä), a Spanish dramatist; born in Madrid, about 1660. He was highly esteemed by his contemporaries as a lyric and dramatic poet. Among his best works are: "Everybody is His Own Pedigree"; and "The Wag of Seville," on which is based the libretto of the opera of "Don Juan." He died about 1722.

**Zamosc,** a fortified town of Russian Poland, province of Lublin; on the Wieprz, 50 miles S. E. of the town of Lublin. It was laid out in 1588 in the Italian style by Jan Zamojski, and all its houses have arcades. Its fine castle, the four churches, the arsenal, and the town house are the chief buildings.

**Zamouse,** the *Bos brachyceros,* a species of *Bovidæ,* or oxen occurring in West Africa, and named the bush cow at Sierra Leone. The ears are specially developed, and a dewlap is absent. The color is a pale brown; the horns curve outward and then upward and inward, and have sharp tips; the hair is thin, and has a tendency to grow erect.

**Zampieri, Domenico.** See DOMENICHINO.

**Zanclus,** in ichthyology, a genus of *Carangidæ* from the Pacific Ocean. Body much compressed and elevated; one dorsal, with seven spines, the third of which is greatly elongated; no teeth on palate; scales minute, velvety. There is but one species, *Z. cornutus,* easily recognized by its long snout and by the broad bands crossing the yellow ground color. It is about eight inches long, and undergoes various changes in its development.

**Zane, Ebenezer,** an American pioneer; born in Berkeley co., Va., Oct. 7, 1747; made the first permanent settlement on the Ohio river in 1770, on the site of the city of Wheeling, and built there a block house called Fort Henry, where he repelled several Indian assaults during the Revolutionary War. He was a disbursing officer under Lord Dunmore; held several military and civil offices, and attained the rank of colonel. The land where the city of Zanesville now stands, on the Muskingum river, formed a portion of his property. He died in Wheeling, Va., in 1811.

**Zanella, Giacomo** (dzä-nel′lä), an Italian lyrical poet; born in Chiampo, Italy, in

1820. After studying for the priesthood, he became Professor of Philosophy and Italian Literature at the seminary in Vicenza. His work is noted for beauty of style and mastery of form; his most popular poem being "The Fossil Shell." His first volume of poems, "Verses," appeared in 1868, and was followed by several others. Among his poetic tales are: "The Little Calabrese" (1870); "Robin Redbreast" (1881); "Italian Literature in the Last Century" (1885). He died in Vicenza, Italy, May 17, 1888.

**Zanesville,** a city and county-seat of Muskingum co., O.; on the Muskingum river, and the Zanesville, Canton and Southern, the Bellaire, Zanesville, and Cincinnati, the Cleveland, Akron and Columbus, and other railroads; 57 miles E. of Columbus. Here are a public library, high school, Female Seminary, street railroad and electric light plants, several bridges across the river, National and private banks, and daily, weekly, and monthly periodicals. The principal interest is manufacturing. The city has blast furnaces, machine shops, foundries, glass factories, paper mills, potteries, flour mills, etc., and an assessed property valuation exceeding $9,700,000. Zanesville was named in honor of EBENEZER ZANE (*q. v.*). Pop. (1890) 21,009; (1900) 23,538; (1910) 28,026.

**Zangemeister, Karl** (tsang'e-mīs-ter), a German philologist; born in Hallungen, duchy of Gotha, Nov. 28, 1837. He edited the fourth volume of the "Latin Inscriptions" comprising the parietal inscriptions at Pompeii, Herculaneum, and Stabiæ (1871); compiled "Specimens of Latin MSS. written in Majuscule Letters" (1882), and "Fragments of the Old Saxon Bible Poem of the Palatine Library" (1894).

**Zangwill, Israel,** an English-Jewish novelist; born in London, in 1864. He began life as a London teacher, and while teaching, graduated at the London University. He edited the periodical "Ariel"; and published: "The Premier and the Painter" (1888, in collaboration), a romance; "The Bachelors' Club" (1891); "The Big Bow Mystery" (1891); "The Old Maids' Club" (1892); "Children of the Ghetto" (1892), a collection of stories; "Merely Mary Ann" (1893); "Ghetto Tragedies" (1893); "The King of Schnorrers" (1894); "The Master" (1895), a novel; "Six Persons," a comedietta; "Without Prejudice" (1896); "Dreamers of the Ghetto" (1898); "They that Walk in Darkness" (1899). He dramatized "Children of the Ghetto," which was brought out in the United States in 1899.

**Zankoff, Dragan,** a Bulgarian revolutionist; born in Sistova in 1827; studied at the Universities of Odessa, Kiev, and Vienna. Though the liberation of Bulgaria was the object of his early aspirations, he entered the service of Turkey, and became secretary to the Pasha of Rustchuk, Bulgaria. In 1880 Prince Alexander made him premier, but was forced to dismiss him in October of that year because Zankoff's brother had, at the meeting of the Danish commission, voted against the presidency of Austria—an action against which the Austrian representative at Sofia protested. From that time Zankoff became the enemy of Alexander and the head of the pro-Russian party. On the night of Aug. 20, 1886, Zankoff with a party of fellow-revolutionists broke into Prince Alexander's palace and forced him to resign. Zankoff afterward became a member of the provisional government. See BULGARIA.

**Zannichellia** (named after John Jerome Zannichelli, a Venetian apothecary and botanist, 1662–1729), the horned pond weed, genus of *Nhandirobeæ;* climbing plants with submerged, linear leaves and minute flowers, generally monœcious. Barren flowers, with the perianth wanting, and a solitary stamen with a two to four celled anther. Fertile flowers with a perianth of one leaf, four or more stamens, an elongated, undivided style, a peltate stigma, and nearly sessile achenes. Known species, one or more, from temperate and tropical climes. If only one species exists it is *Z. palustris,* the common horned pond weed, which floats in ditches and stagnant waters.

**Zanonia** (named after James Zanoni, superintendent of the Botanical Garden at Bologna, and author of a work on plants published in 1673. He died in 1682), a genus of *Nhandirobeæ;* climbing plants with cordate leaves, their axils bearing tendrils with clusters of diœcious flowers. The males have a three-lobed calyx, a rotate corolla with the limb five-parted, and five stamens with one-celled anthers. Female with three styles, and a three-celled ovary developing into a fleshy fruit. The leaves of *Z. indica,* beaten up with milk and butter, are applied as a liniment in antispasmodic affections. They are also used in baths in nervous diseases.

**Zanotti, Jean Pierre** (zä-not'tē), a French painter and poet; born of a Polish family in Paris in 1674. He left a number of noted pictures; and published "Dido," a tragedy (1718); "Poems" (1741); and various works on the art of painting. He died in Bologna, in 1767.

**Zante,** or **Zacynthos,** the Zacynthus of the Romans and of the Greeks, one of the principal Ionian Islands; 9 miles from the N. W. coast of the Morea, and 8 S. of Cephalonia; about 24 miles long, 12 broad. In the W. it attains a maximum altitude of 2,486 feet; the center is fertile, formed by depression, and is mainly devoted to the growing of the dwarf species of vine, originally brought

from Corinth, from which the dried currants of commerce are produced. Zante is mentioned in Homer with the epithet "woody," which is not apt at the present day, though it is justly called in an Italian proverb "the flower of the Levant." It is not volcanic, though thought to be so by the natives from the pitch wells and the not infrequent earthquakes. A large quantity of currants is exported annually, mostly to England, where, according to Lithgow the traveler, they were first introduced from Zante about 1550. Pop. (1896) 45,032. ZANTE, the capital, the largest town in the Ionian Islands, is situated at the head of a small bay or harbor on the E. coast. It is the see of a Greek protopapas, and of a Roman Catholic bishop. Pop. (1896) 14,650.

ZARA: ARCHIEPISCOPAL CATHEDRAL.

**Zanzibar,** a British protectorate in East Africa, which formerly comprised the whole coast between Magdishu (Magadoxo), about lat. 2° N., and Cape Delgado, lat. 10° 42′ S., with the four islands of Zanzibar, Pemba, Lamu, and Mafia. The continental part of the protectorate has become part of British East Africa and German East Africa; while the island and town of Zanzibar, and the island of Pemba, are entirely under British protection. The island (area 600 square miles) is very fertile and well cultivated, being especially suited for the cultivation of cloves, sugar, coffee, cocoa, and various spices, of which there is a considerable export. The population (200,000) is extremely heterogeneous, including Europeans, Arabs, half-caste Portuguese from the Malabar coast of India, and the Suahilis from the mainland. In 1899 Germany removed her rights of extra-territoriality in Zanzibar from such time as the similar rights possessed there by Great Britain should be abolished. The imports in 1899 had a value of $7,983,030, and the exports, $7,567,035. ZANZIBAR, the chief town (100,000 inhabitants), on the W. side of the island, is the center of trade for the E. seaboard of Africa and of missionary and exploring work for the interior. At the instance of the British government the slave trade has been abolished and slavery was nominally abolished in 1897.

**Zapf, Georg Wilhelm** (tsäpf), a German antiquary; born in Nördlingen, 1747. A prolific writer, among his works were: "Bibliography of Ancient and Modern History" (1781); "The Lives of Celebrated Savants and Artists of All Time" (1806); etc. He died in 1810.

**Zappi, Giovanni Battista** (dzäp′pē), an Italian writer; born in Imola, in 1540. He published a remarkable book, prose mixed with verse, entitled "Field and Spiritual Philosophy, in which is Contained the Sum of Christian Living" (1577), treating of the life and character of Christ, the virtues and vices, etc. He died at the end of the century.

**Zappi, Giovanni Battista Felice,** an Italian lyrical poet; born in Imola, about 1667; studied law in Rome, but soon became noted for his poetry, which was distinguish-

ed by elegance and grace of style. A collection of his poems was first published in 1770, and consists of sonnets, songs, cantatas and other verse. He died in Rome, 1719.

**Zara** (Slavonic, Zadar), capital of the province of Dalmatia, Austria; on the coast of the Adriatic; 130 miles S. E. of Trieste. It is built on a narrow promontory, separated from the mainland by a moat. There is a spacious and well protected harbor, and till 1873 the place was strongly fortified. Of its churches the most noteworthy are its archiepiscopal cathedral (1205), founded by Henry Dandolo, Doge of Venice, and the church of the patron saint, St. Simeon. A lofty marble column is all that is left standing of an ancient Roman temple; there are also the remains of a Roman aqueduct. During the 4th crusade it withstood a famous siege by the French and Venetians. The chief manufactures are the making of glass and of maraschino and rosoglio. Pop. 11,861, mainly Italians.

**Zaragossa.** See SARAGOSSA.

**Zaramo** (zä-rä′mo), or **Wazaramo** (wä-zä-rä′mo), a Bantu tribe of German East Africa.

**Zarate, Antonio Gil y,** a Spanish dramatic poet; born in San Lorenzo de l'Escurial, Spain, in 1795. His father, an excellent actor, sent him to study in Paris; and on his return to Spain he became Professor of Physics in Granada. He afterward wrote dramas noted for striking situations, lively dialogue, and elegant versification. Among them are: "Blanche of Bourbon" (1835); "Guzman the Brave"; "The Czar Demetrius"; etc. He also published a much-esteemed history of Spanish literature. He died in 1860.

**Zarate, Augustin de** (thä-rä′tā), a Spanish historian; born about 1492. He was comptroller of Castile; accompanied Nuñez Vela, viceroy of Peru, to South America in 1543; was afterward treasurer of the Spanish Netherlands. He wrote: "History of the Discovery and Conquest of the Province of Peru" (1555). There have been many later editions; and it has been translated into French and Italian. He died in Madrid about 1560.

**Zarathushtra,** See ZOROASTER.

**Zaratite** (after Señor Zarate, of Spain), a mineral occurring as an encrustation on magnetite and chromite; hardness, 3–3.25; sp. gr., 2.57–2.693; luster vitreous; color, emerald green transparent to translucent; composition: Carbonic acid, 11.7; oxide of nickel, 59.4; water 28.9 = 100, which is equivalent to the formula $NiOCO_2 + 2NiOHO + 4HO$.

**Zarncke, Friedrich** (tsärn′ke), a German antiquary; born near Brüel in Mecklenburg-Schwerin, July 7, 1825. After 1852 he was professor in the University of Leipsic. Among his works are: "The German Cato" (1852); "The Nibelungen Question" (1854); "Contributions to the Explanation of the Nibelungenlied" (1857); "The Trojan Legend of the Franks"; "German Universities in the Middle Ages" (1857); 'Mediæval Proverbial Poetry" (1863). He died Oct. 15, 1891.

**Zareeba.** See ZERIBA.

**Zbylitowski, André** (zbē-lē-tov′skē), a Polish writer, philosopher, and poet; born in Galicia in 1732. He was doctor of literature and philosophy in Cracow, and afterwards traveled extensively in Europe and South America. He wrote poetry with much success; some of his idyls being noted for beauty of coloring, elegance, and grace. Among his works are: "Rhythms in Polish Verse" (1763); "The Marshal" (historical); "A Beard," a novel; and various books on philosophical, political, and grammatical themes. He died in 1813.

**Zbylitowski, Pierre,** a Polish poet and miscellaneous writer; born in the palatinate of Lublin in 1684; studied at the University of Warsaw, and later traveled extensively in Europe and North America, being a keen observer and profound critic. As a poet he was a disciple of the French school, using sarcasm and irony with brilliant effect. Among his writings are a "Collection of Satires" (1723); "Porydia: A Poem" (1734); 'Epigrams" (1735); "Studies on Voltaire's Works" (1737); "Lucie: An Erotic Poem" (1739); etc. He died in Warsaw, in 1757.

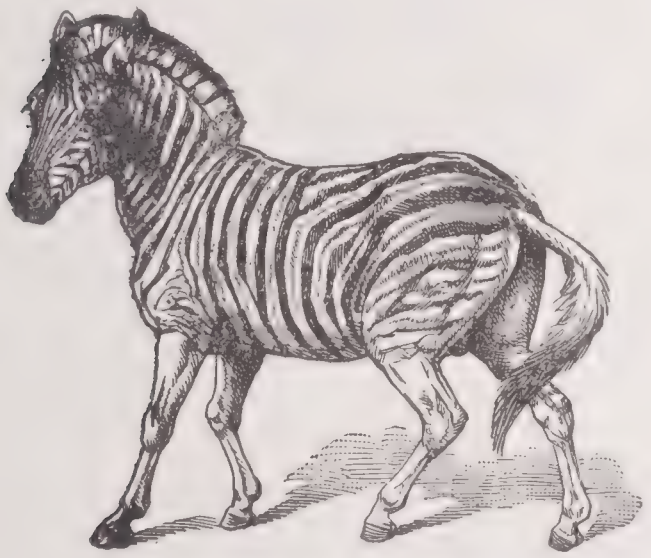
**Zea.** See CEOS.

**Zea, Francisco Antonio,** a South American diplomatist; born in Medellin, Colombia, Oct. 20, 1770; for sharing in a revolutionary movement was imprisoned at Cadiz, Spain (1797–1799), but in 1805 became Professor of Botany at Madrid. By Joseph Bonaparte was appointed Minister of the Interior and Governor of Malaga (1808–1813). Returning to South America (1814), he joined Bolivar, and after rising to be intendant-general of the forces, held the vice-presidency of Venezuela (1818–1819). Ill health, however, compelled him to revisit Europe, and having as minister plenipotentiary concluded a Colombian loan of $10,000,000 with London bankers, he died in Bath, England, Nov. 22, 1822.

**Zealand** (Danish, Själland), the largest and most important island of Denmark; lies between the Cattegat and the Baltic, and is separated by the Sound from Sweden and by the Great Belt from Fünen; length, 81 miles; extreme breadth, 67 miles; area, 2,670 square miles. The surface is nearly everywhere flat, except in the N. peninsulas; the coasts, which are rockbound on the S. E., are indented by bays and fiords, the chief of which is the Roeskilde-Isefiord in the N. The rivers are small, but there are

numerous lakes, and all the waters abound in fish. The island contains several beech forests, is exceedingly fruitful in corn (particularly barley and rye), and breeds excellent horses and cattle. Agriculture and cattle-breeding are the principal employments of the inhabitants. The chief place is Copenhagen on the E. coast; the next in rank and size are Elsinore in the N. and Korsör in the S. W.

**Zealand** (Dutch, Zeeland), a province of the Netherlands, consists of portions of Flanders (East and West) and of the islands Walcheren, North Beveland, South Beveland, Schouwen, Duiveland, and Tholen; area 690 square miles, and a pop. (1909) of 231,958, about three-fourths Protestants. The provincial capital is Middelburg; Flushing is also in Walcheren. The greatest part of the soil, which is a rich clay, has been redeemed from the sea; and the number of polders or drained districts, is about 400. The neighboring seas abound with fish, and in Schouwen many eggs are collected, myriads of waterfowl resorting thither to form their nests. In 1866 a ship canal through the island of South Beveland was made to take the place of the Easter Scheldt. Hence came the name of New Zealand.



BURCHELL'S ZEBRA.

**Zebra,** a popular name for any of the striped forms of the genus *Equus;* thus embracing the quagga, the true zebra, and Burchell's zebra. In all three the external characters are those of the ass rather than of the horse; the legs are without warts, the tail is furnished with long hairs only toward the extremity, the neck is full and arched, and the mane stiff and erect. All the species of this division are rapidly vanishing before advancing civilization, and in all probability will become extinct before very many years. The true zebra is the *E. zebra,* from the mountainous regions of South Africa. It stands about 4½ feet at the shoulder; ground tint white, with black stripes, vertical on body and horizontal on legs; limbs slender, head light, ears long and open. The zebra lives in small herds in secluded spots; its sense of hearing, sight, and smell is extremely acute, and on the least alarm the whole herd scampers off. When compelled to defend themselves zebras form a compact body with their heads in the center and their heels outward, and have been known to beat off the leopard with their kicks. The zebra has been domesticated, but its vicious temper renders it of little value as a beast of burden. Burchell's zebra (*E. burchellii*) differs little from the true zebra, except in the fact that the ground tint is yellow.

**Zebra Wolf,** or **Zebra Opossum,** a popular name given by the early colonists of Van Diemen's Land to *Thylacinus cynocephalus,* from the stripes on its body and its general dog-like appearance.

**Zebra Wood,** in botany and commerce: (1) A kind of wood, imported from South America, and used by cabinet makers, produced by *Omphalobium lamberti,* a large tree belonging to the natural order *Connaraceæ,* and growing in Guiana. Its colors consist of brown on a white ground, clouded with black, and each strongly contrasted, thus somewhat resembling the skin of a zebra. Called also pigeon wood. (2) The wood of *Eugenia fragrans,* variety *cuneata.* It is a shrub about eight feet high, growing in Jamaica. (3) The wood of *Guettarda speciosa,* a tree 25 feet high, with scarlet-colored flowers, growing in the East Indies.

**Zebu.** See CEBU.

**Zebu,** the native name for any breed or individual of *Bos indicus* (which by some authorities is considered a variety of *Bos taurus,* the common ox). The zebus attain their greatest development in India, but range E. to Japan and W. to the Niger

THE ZEBU.

river. They vary greatly in size, some being larger than European cattle, while others are no bigger than a month-old calf.

The horns differ in form; the dewlap is more or less developed; one hump is always present over the withers, sometimes there are two; color varying from light ashy gray to pure white. At present they exist only in a domesticated condition, and must have been early reduced to subjection by man, since all the sculptures of cattle at Elephanta, which are of high antiquity, represent the humped form. In many parts of India zebus are used as beasts of draught and burden, and occasionally for riding. In disposition they are gentle and docile, and are venerated by the Hindus, who consider it a sin to slaughter them, though they do not object to work them. White zebu bulls, which are held particularly sacred by the Hindus, are branded with the image of Siva, relieved from all labor, and allowed to wander at will, levying contributions on the stalls in the bazaars without let or hindrance. Their flesh is inferior to that of the common ox, except the hump, which is esteemed a delicacy.

**Zebulun,** the 10th son of Jacob; he gave his name to one of the 12 tribes of Israel, and to a region of Palestine. At the first census the tribe numbered 57,400, and 60,500 at the second. The territory of the tribe lay in the fertile hilly country to the N. of the plain of Jezreel, and included Nazareth.

**Zechariah,** or **Zacharias,** the name of many ancient Hebrews, including two prophets, various priests, and Levites (I Chron. ix: 21; xv: 24; xxvi: 14; Neh. xii: 35, 41).

In the Old Testament canon, the 11th in order of the 12 minor prophetic books. The name prefixed to it is that of "Zechariah, the son of Berechiah, the son of Iddo the prophet" ("the prophet" means Zechariah, not Iddo), Zechariah i: 1. In Ezra v: 1, vi: 14, he is called the son of Iddo, but son is sometimes used vaguely for lineal male descendant, and may easily signify grandson (Gen. xi: 24–32; xxviii: 5; xxix: 13). When Cyrus permitted the Jews to return from Babylon he also accorded them permission to rebuild the temple (Ezra i: 3; vi: 3–5), and the foundations of the edifice were at once laid (Ezra iii: 10–13). The jealousy of the neighboring tribes led to the stoppage of the work (Ezra iv: 1–24). At length, however, in the second year of Darius Hystaspes, permission was obtained to resume it (Ezra iv: 24; vi: 1–12), and building was recommenced with the patronage and active aid of Zerubbabel, the civil governor of Judæa, Joshua the High Priest, etc. Enthusiasm for the work was excited among the previously apathetic people by the prophets Haggai and Zechariah (Ezra v: 1–2). The former seems to have been the senior in point of years, and commenced his addresses and predictions in the sixth month of the second year of Darius, while Zechariah did so in the eighth month. The book of Zechariah, in its present form, is naturally divided into three portions — chaps. i–viii., chaps. ix–xi., and chaps. xii–xiv. The first is universally admitted to be the work of Zechariah. The natural sections of it are (1) chap. i: 1–6, dated the second year of Darius' reign and the eighth month; (2) i: 7–vi: 15, dated the 24th day of the 11th month of the same year; and vii: 1–viii: 23, dated the fourth day of the ninth month of Darius' fourth regnal year. In the first the prophet counsels a return to Jehovah; in the second,

ZECHARIAH, BY MICHAEL ANGELO.

which has in it various symbolic visions, he encourages the building of the temple, and, in answer to a query whether the fasts begun at Babylon should be continued, he directs that they should be transformed into joyous festivals. The style of chapters ix.–xi. differs from that of the first eight; and that of xii.–xiv. to a certain extent from both. In x: 6, the house of Judah requires to be strengthened, as if its government still continued; that of Joseph (the ten tribes) to be saved, as if it were gone; and in verse 11 is the prediction "the pride of Assyria shall be brought down," as if it stood when the words were penned; whereas by the time of Darius Hystaspes it had forever passed away. Some, therefore, assign these chapters to an earlier Zechariah, a contemporary of Isaiah, (about 736 B. C.). But if the Hebrew Javan in ix: 13 is correctly translated Greece, this would suggest a date late enough to be consist-

ent with the best-known Zechariah's authorship, if not more recent still. Chaps. xii.–xiv. have been referred to some prophetic contemporary of Jeremiah, 607 or 606 B. C. The date of chaps. i.–viii. is admitted to be 520–518 B. C. Matt. xxvii: 9–10, nominally quoting Jeremiah, seems to refer to Zech. xi: 12–13, and unless Zechariah, the son of Berechiah, of whose death we know nothing, was martyred precisely in the same way as Zechariah, the son of Jehoiada (II Chron. xxiv: 20, 21), the reference in Matt. xxiii: 35 would seem to be to the latter. Of these difficulties various solutions have been given. Zech. xii: 7 is quoted by our Lord as Messianic (Matt. xxvi: 31, Mark xiv: 27). In Matt. xxi: 5, Zech. ix: 9 is regarded as predictive of the entry of Jesus into Jerusalem.

**Zechstein,** a technical term applied by German miners to a stratum of dolomitic limestone immediately overlying the kupferschiefer or mergel-schiefer. The latter is a marl slate containing copper pyrites, besides numerous fossils, and much worked in Germany as a valuable ore of copper. Both formations correspond to the Middle Permian of English geologists.

**Zedekiah,** the son of Josiah, King of Judah, placed on the throne after Jehoiakin had been removed by Nebuchadnezzar, on his second taking of Jerusalem, 599 B. C. He reigned during 11 years, "and he did that which was evil in the sight of the Lord his God." He entered into an alliance with Pharaoh-Hophra, King of Egypt, and revolted against Nebuchadnezzar, who thereupon laid siege to Jerusalem. The prophet Jeremiah counselled Zedekiah to save his city and throne by submission to the Chaldeans; but the king, disregarding this advice, maintained his defense of the city. The Egyptians came to his relief; but, on Nebuchadnezzar offering them battle, they retreated to their own country, and Jerusalem, after undergoing a siege of 19 months (in the latter part of which a terrible famine raged), was taken, 586 B. C. The king endeavored to escape, but was captured, and condemned to behold his sons slain before him; after which his eyes were put out, and he was carried, bound with fetters of brass, to Babylon. The city was almost entirely destroyed, and the people led into captivity.

**Zedlitz, Baron Joseph Christian von** (tsed'lits), an Austrian lyrical poet and dramatic writer; born in Johannisburg, Austrian Silesia, in 1790. He was educated at Breslau, and afterward took part in the campaign of 1809. Among his best dramatic writings are: the tragedies "Two Nights in Valladolid" (1825) "The Star of Seville" (1830); and the drama "Prison and Crown" (1834), treating of the last days of Tasso's life. Of poems, he has published a collection, "Wreaths for the Dead"; a celebrated ballad, "The Nightly Review"; and poetical tales. He died in Vienna, in 1862.

**Zedoary** (Arabic, Jedwar), certain species of curcuma, natives of India, China, etc., whose root stocks are aromatic, bitter, pungent, and tonic, and are used for similar purposes with ginger. They are more used in the East than in Europe. The round zedoary of the shops is the produce of *C. zedoaria*, having palmate root stocks, straw-colored within. Long zedoary is produced by *C. zerumbet*, having long palmate root stocks, yellow within. Zedoary is a powerful sudorific.

**Zeehan** (Dutch, Zeehaan, "sea hen"), a mining township on the W. coast of Tasmania; 29 miles from the port of Strahan on Macquarie harbor. The name is taken from a prominent mountain, three miles S. W., which Tasman discovered in 1642, and christened Mount Zeehan, after one of the two ships which formed his expedition. The township owes its existence to the discovery in 1884, by two pioneer prospectors, Frank H. Long and William Johnstone, of rich silver-lead ores in great abundance, extending over an area of more than 160 square miles. The Mount Zeehan silver-lead mines, the largest company in the field, had by the end of 1892 exported to England 600 tons of ore, containing 400 tons of lead, and upward of 60,000 ounces of silver, valued at $125 per ton.

**Zeise, Heinrich** (tsī'zuh), a German poet and translator; born in Altona, in 1822. He began life as an apothecary, but was graduated at a university. He translated a number of scientific and poetical works from the Danish into German, and also published original efforts, noted for poetical coloring and beauty of form, among them a collection of "Poems" (1847); "Battle Songs of Schleswig-Holstein" (1848); "Songs of Battle and Sword"; etc.; also in prose, "From the Life and Recollections of a North German Poet" (1888).

**Zeising, Adolf** (tsī'zing), a German writer on art; born in Ballenstedt, Sept. 24, 1810. He wrote: "New Doctrine of the Proportions of the Human Body" (1854); "Æsthetic Researches" (1855); "The Metamorphoses in the Ratios of the Human Figure" (1859); "Religion and Science, State and Church" (1873); and several novels. He died in Munich, April 27, 1876.

**Zeissberg, Heinrich, Baron von** (zīs'berg), an Austrian historian; born in Vienna, July 8, 1839. He was appointed Professor of History in the University of Vienna in 1873. His principal writings are: "Arno, First Archbishop of Salzburg" (1863); "Polish Historiography in the

Middle Ages" (1873); "Minor Sources of Polish History in the Middle Ages" (1877); "Belgium under the General Statthaltership of the Archduke Karl" (1893).

**Zeithun,** a district in the province of Aleppo, Asiatic Turkey, inhabited by a body of Armenian Christians. It is fertile but mountainous, and the people, who are almost independent of Turkish authority, are distinguished by their martial spirit and their immunity from crimes of violence. There is also a town of the same name. This singular community is a survival of the Armenian kingdom which subsisted in Cilicia from the 11th to the 14th century. A sanguinary conflict which took place here soon after the Crimean War first drew the attention of Europe to this people. It was stopped by the intervention of the British and French consuls. In the spring of 1879 the Turkish pasha, enraged at the depredations of some neighboring marauders, sent troops against the city, and the intervention of the English consul at Beyrout alone saved it from destruction.

**Zeitz** (tsīts), a walled town of Prussian Saxony; in the government of Merseburg, 23 miles S. W. of Leipsic. It lies in a pleasant and fruitful district on the right bank of the White Elster. The town has a good library, containing over 12,000 volumes, and manufactures of woolens, cottons, calicoes, sugar, wax cloth, leather, pianofortes, cycles, hosiery, gloves, etc. Pop. (1900) 27,391.

**Zela,** in ancient geography, a town in Pontus, Asia Minor, where Julius Cæsar defeated Pharnaces, King of Pontus, son of Mithridates. Cæsar, in announcing his victory, sent his famous dispatch to the senate of Rome, in these words: "*Veni, vidi, vici,*" "I came, I saw, I conquered" (perhaps the shortest dispatch on record). This battle ended the war; Pharnaces escaped into Bosporus, where he was slain by his lieutenant, Asander; Pontus was made a Roman province, and Bosporus given to Mithridates of Pergamus, 47 B. C.

**Zelaya,** a town of Guanajuato, Mexico, on the Rio Grande de Santiago, 120 miles W. N. W. of Mexico. It has a large and elegant cathedral, with several other churches. The suburbs are squalid, and are inhabited chiefly by Indians. Zelaya manufactures cotton.

**Zelaya, José Santos** (thā-lä'yä), a Nicaraguan statesman; born in Managua, Nicaragua in 1845; became a general, the leader of the Liberal party, and several times president; and was forced by internal and international complications to resign in 1909.

**Zeleguy, Zdenko** (tsel'eg-wē), pen name FRANZ VONEISEN, a Moravian poet; born in Usetin, Jan. 22, 1853. His best-known works are: "World-Pain Voices" (1887); "Nirvana" (1893); and "Words of Love" (1894).

**Zelkona Tree,** a name given to *Planera Richardi,* a large elm-like tree, native of the Orient. The timber is much prized, the heartwood when dry being exceedingly hard, capable of a fine polish, and is an excellent furniture wood.

**Zell, Karl,** a German humanist; born in Mannheim, Germany, April 8, 1793; studied philology at Heidelberg, Göttingen, and Breslau; and became professor in the Rastatt Lyceum in 1814, and in the University of Freiburg in 1821. Here he founded a school of philology in 1830, and in 1835 was nominated to the ministerial council. In 1847 he became Professor of Archæology at Heidelberg, and from 1848 to 1853 he sat in the Second Chamber of Baden. At the diet of 1851 with Hirscher he exerted himself to promote the greater freedom of the Church. In 1855 he retired from his chair. Zell edited a collection of Latin classics (17 vols. 1827–1831), to which he himself contributed the Phædrus, the Horace, and the "The Republic" of Cicero. He next edited the "Ethica Nicomachea" of Aristotle (2 vols. 1833), and translated the "Orgagnon" (5 vols. 1836–1840). His chief works, however, are "Holiday Stories" (3 vols. 1826–1823; new issue 1857); "Handbook of Roman Epigrams" (3 vols. 1850–1857); and "Lioba and the Happy Angels" (1860). He also published "On the Iliad and the Nieblungen Legend" (1843), and his course of university lectures (1857). He died in Heidelberg, Jan. 24, 1874.

**Zeller, Berthold** (zel'lār), a French author; born in Rennes, France, in 1848; son of Jules S. He wrote: "Henri IV. and Marie de' Medici" (1877); "Critical Studies on the Reign of Louis XIII." (2 vols. 1879–1880); "Marie de' Medici and Villeroy" (1897).

**Zeller, Christian Heinrich,** a German educator; born near Tübingen, March 29, 1779. His writings are: "Teachings of Experience for Christian Teachers of Rural and Poor Schools" (3 vols. 1827); "Soul-Doctrine, Founded on Scripture and Experience" (1846). He died in Beuggen, May 18, 1860.

**Zeller, Eduard,** a German theologian, philosopher, and historian; born in Kleinbottmar, Würtemberg, Jan. 22, 1814. He studied at Tübingen and Berlin; and despite the very free tendencies of his thought, strongly influenced by that of Strauss, he was Professor of Theology at Bern, and later Professor of Philosophy at Heidelberg and at Berlin. He resigned and retired to Stuttgart in 1894. Among his chief works are: "Platonic Studies" (1839); "The Philosophy of the Greeks"

(1844–1852); "The Story of the Apostles, Critically Investigated" (1854); "David Friedrich Strauss Depicted in his Life and Writings" (1874); "Frederick the Great as a Philosopher" (1886); etc.

**Zeller, Jules Sylvain** (zel-lār'), a French historian; born in Paris, France, April 23, 1820. He became Professor of History in the Polytechnic School in 1863, and general inspector of higher education in 1876. Among his works are: "The Roman Emperors: Characters and Portraits" (1863); "History of Germany" (1872–1891); "The Tribunes and the Revolutions in Italy" (1873); "Pius IX. and Victor Emmanuel: Contemporary History of Italy" (1879); "Short History of Italy from the Fall of the Roman Empire to our Time" (4th ed. 1886).

**Zem,** the sacred well of Mecca. According to Arab tradition, this is the very well that was shown to Hagar when Ishmael was perishing of thirst. Mecca is built round it.

**Zemindar,** in India, one of a class of officials created under the Mogul government of India. They have been regarded, first as district governors, secondly as landed proprietors, and thirdly as farmers or collectors of the government revenue on land. Their functions appear to have been to a great extent arbitrary and variable, but founded on and arising out of the last-named office. On the transference of the authority of the Moguls to the East India Company, the zemindars were in general treated as the proprietors of the land. The term is of Persian origin, and the office probably originated with the Mohammedan conquerors of India, who claimed the soil of the country, but, leaving the Indian village tenure intact, set these officers called zemindars over districts comprising each a certain number of villages, the headmen of which accounted to them for the revenues of the land, which they collected with a liberal profit to themselves. At present, in Bengal, the zemindars have all the rights of a British landed proprietor, subject to the payment of the land tax, and also to a certain ill-defined tenant right on the part of tenants who have long held possession of their farms.

**Zenana** (ze-nä'nä) (Hindustani, *zanána,* or *janana;* Persian *zanan,* "women"), the apartments in which Indian women are secluded, corresponding to the harem in Arabic-speaking Moslem lands. In India the Mohammedan women are much in the same position as the women in the other less bigoted Mohammedan countries. Among those of the Hindu faith the women of all castes are more or less secluded. Especially among the well-to-do and wealthy and in the higher castes the women were strictly confined to the apartments reserved for them — often those looking into an inner quadrangle — and were never to be seen in public. This usage, like many Hindu usages, does not seem to be based on the oldest Hindu scriptures; but it has been very strictly observed till of late, when the influences of European education and zenana missions have, in the larger towns, done much to relieve the monotony of the Hindu women's lives. Till about 1860, when zenana missions were organized in Bengal by Mr. Fordyce, Christian women were not allowed to enter a Hindu zenana. Now thousands of Hindu ladies are taught by British, American, and native Christian women, some of whom are completely trained medical missionaries.

**Zenana Mission,** a mission founded in 1852 under the auspices of the Protestant missionary societies in India, with the object (1) of sending the Gospel to the women of India by means of female missionaries; (2) of alleviating their sufferings in sickness, and ministering to their spiritual need, through the agency of duly qualified female medical missionaries; and (3) of promoting education, based on Holy Scripture, especially among women of the higher classes.

**Zend,** an ancient Iranian language in which are composed the sacred writings of the Zoroastrians. It is coeval and cognate with the Vedic Sanskrit. It embraces two dialects, called the Bactrian, or Eastern Iranian, and the Western Iranian. The two Zend dialects consist of an earlier and a later, analogous to the Vedic and classic Sanskrit, or to the Homeric and classic Greek. The earlier dialect is called the Gâtha, from the Gâthas of sacred songs, which form the only remains of it; the later is that in which the Zend Avesta, or sacred Zoroastrian writings are found. The present alphabet is comparatively modern, and is probably derived from the Syrian. There are 12 simple vowels, 14 diphthongs, and 29 consonants, represented by different characters. The roots are mostly monosyllabic, some consisting of only a single vowel, others of a vowel and consonant, or a vowel between two consonants. There are three numbers, singular, dual, and plural.

**Zend Avesta** (usually interpreted to mean "authorized text" and "commentary"), the religious book of the Parsees or representatives of the old creed of fire-worshipers. The original is written in the primitive Zend language, with a translation into the comparatively modern Pehlvi made by order of the Sassanian dynasty, A. D. 235–651. In antiquity, the work ranks second to the Vedas, while its language is also the nearest sister of the Sanskrit. Traditionally, the whole is regarded as the composition of Zoroaster, to whom it was

directly revealed. But modern scholarship is able to discriminate between different portions, and assign each approximately to its own period. The oldest part may possibly date back to 1200 B. C. What is now in existence is evidently but a very small portion of the complete work, which is reported to have consisted of 21 *nosks* or volumes, of which only one, the Vendidad, now survives in its entirety. In addition, the sacred text contains the Yazna, the Visparad, and the Yasht. These are mainly composed of hymns and sacrificial prayers, addressed either to Ormuzd or to the numerous archangels and powers of nature. The Yazna includes five Gâthas or prayers — the only portion of the work which modern criticism is disposed to assign to Zoroaster himself. The Vendidad, which has been called the Pentatauch of the Parsees, is a code of ceremonial observance. From the point of view of comparative philology the Zend possesses an importance and interest second only to Sanskrit. Its discovery, or rather its successful decipherment, dates from the 19th century. Preserved only in the Zend Avesta, it remained unknown, or at least unintelligible, to European scholarship, till the enthusiasm of a French traveler, Anquetil Duperron, brought back an imperfect translation of the Zend Avesta from India in 1761. A learned Dane, Rask, followed in his steps, and published the first scientific treatise on the language in 1821. It was the great French philologer, Eugene Burnouf, who definitely assigned to Zend its true place among the offshoots of the august Aryan stock. Though existing in comparatively few fragments, much corrupted by dialectal decay, Zend is now admitted to take rank as an elder sister, more primitive than either Greek or Latin, and almost contemporaneous with Sanskrit. As a spoken language, it is thought to have become extinct in the 3d century B. C. In richness of grammatical modifications, and in redundancy of forms for composition, as well as in general similarity of radical framework, it closely approaches the classical Sanskrit of the Vedas.

**Zenith,** the highest point in the heavens to a spectator at any given place, the point from which if the earth were absolutely spherical a perpendicular let fall would pass through its center. Also used to express the highest point of a person's fortune; the highest or culminating point of any subject referred to.

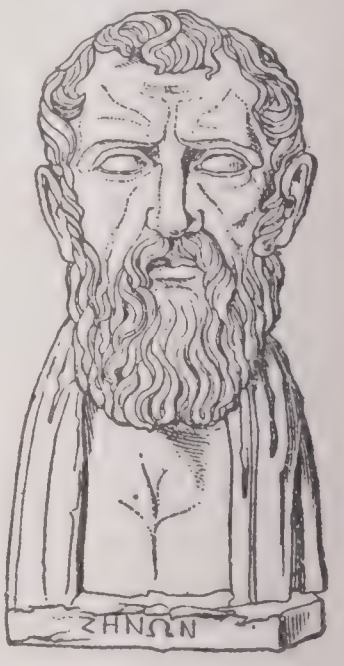
**Zenith Sector,** an astronomical instrument, consisting of a telescope swinging upon pivots, and having attached to it an arc graduated into degrees and minutes. From the upper end of the telescope vertically hangs down a fine silver wire, terminated by a weight supported in water to keep it steady. It is used for the same purpose as the mural circle, viz., to ascertain the zenith distance of the several stars, but is more convenient from its greater portability.

**Zenith Telescope,** a form of instrument used in field astronomy for the determination of latitudes, by the measurement of the difference of meridian-zenith distance of two stars, one culminating N. of the zenith, and the other at so nearly the same distance S. that that difference can be measured by a filar micrometer in the field of the telescope when the latter is revolved 180° round a vertical axis between the two culminations. A delicate level attached to the telescope furnishes a reference point for the measures, and as they are all differential the method compares very favorably with the best observatory methods with larger instruments.

**Zeno,** Emperor of the East from 474 to A. D. 491. One of the chief events of his reign, which was full of vicissitudes, was the permission given by him to Theodoric to dethrone Odoacer, which led to the establishment of the Ostrogothic kingdom in Italy.

**Zeno, Apostolo** (dzā′nō), an Italian dramatist and historian; born in Venice, Italy, in 1668. He has been called the father of Italian opera, and acquired great fame by his dramatic works, published in 1744, in many volumes. Among his other works are: "Historical Dissertations" (1752–1753); and "Epistles" (1785). He died in Venice, in 1750.

**Zeno of Cyprus,** a Greek philosopher, founder of the Stoic school; born in Citium, a small town in Cyprus, probably about 355 B. C. His father Mnaseas was a merchant, and brought him up to the same calling. But the writings of the Socratic philosophers fell in his way, and attracted him to a higher field; and the accident of his shipwreck, with the loss of a valuable cargo, on the coast of Africa, left him poor, and free to follow his genius, and become a philosopher. He first attended at Athens the lectures of Crates, the cynic; but soon, dissatisfied, turned to Stilpo of the Megaric school, and afterward to the philosophers of the Academy, Zenocrates and Plato. He did not perma-



ZENO OF CYPRUS.

nently adhere to any of these schools, but after 20 years' ardent inquiry and pursuit of truth, began to teach a system of his own. He gathered his disciples in the *Stoa*, or Portico painted by Polygnotus, whence the name of his school — the Stoic. Zeno was of feeble health and deeply thoughtful aspect; lived very abstemiously, presided over the school for 58 years, and reached, it is said, the age of 98. His personal character was the faithful counterpart of his doctrine, and he was held in such high honor by his fellow citizens, that they are said to have placed in his keeping the keys of their citadel. He probably died about B. C. 263. See STOIC.

**Zeno of Elea,** a Greek philosopher, and a follower of the Eleatic sect. He studied under Parmenides, and accompanied that philosopher to Athens about 454 B. C. According to Aristotle, he was the first who taught dialectically. An ardent patriot, he endeavored to deliver his country from the sway of a tyrant; but the conspiracy in which he was engaged having been discovered, he was put to death in a barbarous manner. He was the author of several philosophical works, none of which have survived. Aristotle has, however, preserved the arguments which Zeno held against the existence of absolute motion. He flourished in the 5th century B. C.

**Zenobia,** a Queen of Palmyra, who succeeded to the throne as regent for her sons on the murder of her husband Odenathus, A. D. 266. Not content, however, with the independence granted by the indolent Emperor Gallienus and his successor, Claudius, she aimed at a dominion which should include Egypt, Syria, and Asia Minor, and make good her vaunted title of Queen of the East. The accession of Aurelian, however, in 270, once more placed a soldier at the head of the Roman empire, and in 273 the armies of Zenobia were defeated in two pitched battles, while Palmyra was taken and its queen made prisoner. According to Zosimus she died on her way to Rome, but according to Trebellius Pollio, whose narrative is much more particular, she was led in triumph through Rome in the train of Aurelian, and was afterward presented by her conqueror with a villa at Tibur, where she passed the remainder of her life with her sons after the manner of a Roman matron. Zenobia was one of the most remarkable women of antiquity. She resembled Cleopatra in her talents and her personal fascination, but she far surpassed her in purity and elevation of character. "She is," says Gibbon, "perhaps the only female whose superior genius has broken through the servile indolence imposed on her sex by the climate and manners of Asia."

**Zenos, Andrew C.,** an American educator; born in Constantinople, Turkey, Aug. 13, 1855; was graduated at Robert College, Constantinople, in 1872; pastor of a Presbyterian Church in Brandt, Pa., in 1881–1883; Professor of Greek in Lake Forest University in 1883–1888, of New Testament Exegesis, at Harvard Theological Seminary in 1888–1891, of Church History in McCormick Theological Seminary in 1891–1894, and of Biblical Theology after 1894. He wrote: "Elements of Higher Criticism"; "Compendium of Church History"; etc.; and edited "Anabasis" (with Prof. F. W. Kelsey).

**Zenta** (zen'to), in Hungary, the scene of a battle where the Germans, under Prince Eugene, defeated the Turks, Sept. 11, 1697. This victory led to the peace of Carlowitz, ratified in January, 1699.

**Zeolite,** a generic term applied to a very large family of secondary minerals, supposed to have been formed by the action of water upon the original constituents of volcanic rocks. They are all hydrated silicates, mostly of the alkalies, and alkaline earths, and containing from 10 to 25 per cent. of water. They occur usually in cracks and crevices in traps and other ancient igneous rocks, and as typical examples may be mentioned analcime apophyllite, stilbite, and natrolite. The name is derived from the circumstance that all these minerals froth and bubble up when heated in the flames of the blow pipe.

**Zephaniah,** a prophet, son of Cushi, who again was the son of Gedaliah, son of Amariah, the son of Hizkiah (the king?).

In the Old Testament canon, the ninth in order of the 12 minor prophetic books. Zephaniah prophesied in the reign of Josiah, King of Judah. Josiah, who came to the throne in his eighth year (B. C. 641), tolerated idolatry till the 12th year of his reign (641–630); next for six years more (630–624) he carried on a partially successful contest against it; then during the remainder of his life (624–610) he made the reformation more sweeping, reëstablishing Mosaic institutions throughout the land. When the prophet wrote, the worship of Baal had not quite ceased, nor had other forms of idolatry (Zeph. i: 4–5). His predictions, therefore, seem to have been uttered during the second period, sometime between 630 and 624. With this agrees the reference in ch. ii: 12–15 to the impending destruction of Nineveh, which took place in 625. Zephaniah was contemporary with Jeremiah. The first chapter of the book denounces coming judgment, described as the day of the Lord on Jerusalem and the Jewish people. The second prophesies the destruction of Gaza, Askelon, and the Philistine cities generally, the Moabites, the Ammonites, and the Assyrian capital Nineveh. The third censures the

corruption of Jerusalem, which had affected princes, judges, priests, and prophets, and concludes with promises of future restoration and felicity. The chief characteristics of this book are the unity and harmony of the composition, the grace, energy, and dignity of its style, and the rapid and effective alternations of threats and promises. Its prophetical import is chiefly shown in the accurate predictions of the desolation which has fallen upon each of the nations denounced for their crimes: Ethiopia, which is mentioned with a terrible invasion, being alone exempted from the doom of perpetual ruin. The general tone of the last portion is Messianic, but without any specific reference to the person of our Lord. No serious controversy has ever taken place as to the authenticity of Zephaniah.

**Zepharovichite** (after Professor Zepharovich), a crystalline to compact mineral found in sandstone at Trenic, Bohemia; hardness, 5.5; sp. gr. 2.37; color, greenish, yellowish, or grayish-white; composition: Essentially a hydrated phosphate of alumina, with the probable formula $Al_2O_3PO_5 + 6HO$.

**Zephyria.** See HALICARNASSUS.

**Zerbi, Rocco de** (dzār'bē), an Italian journalist; born in Reggio, Calabria, in 1843. He served in the army in 1860–1866; founded the influential "Giornaletto of Naples" in 1868; and became member of the chamber of deputies in 1872. He wrote: "Aspirations" (1865), in verse; "Poetry and Prose" (1868), "Without Title" (1870), both romances; "Political Writings" (1876); "Vistilia" (1877), a romance; "Modern Art" (1878); "Church and State" (1878); "Faust" (1878), a notable critical work: etc.

**Zerbst,** a town of Germany in the duchy of Anhalt, formerly capital of the principality of Anhalt-Zerbst; on the Nuthe, 26¼ miles S. E. of Magdeburg. The chief buildings are the Nikolaikirche, dating from the 15th century; the great Schloss, surrounded with a park; and the stately old Rathhaus, dating from the 15th century, but disfigured by additions in 1610, standing in the market place, in the center of which are the Roland column (1445), and the Butterjungfer, a slender column bearing a female figure. Zerbst contains a gymnasium of high repute — the Francisceum — and has manufactures of silks, plush, cloth, leather, gloves, gold and silver lace, soap, starch, essences, tobacco, chemicals, pottery, umbrellas, musical instruments, and machinery. Gardening, iron founding, and beer brewing are also carried on.

**Zeriba,** or **Zareeba,** a word which came into use in the early part of 1884, during the military operations in Egypt, to denote an inclosure the sides of which are formed of prickly brush wood, sheltered by which a force may camp comparatively safe from sudden surprise.

**Zermatt** (tser-mät'), an important center for tourists in Switzerland; a small village near the upper end of the Visp valley in Valais; 25 miles S. S. W. of Visp. It stands 5,315 feet above the sea, having to the S. the great Théodule glacier, above which towers the Breithorn on the E. and beyond the Monte Rosa group, and on the W. the rocky cone of the Matterhorn. Railway communication was opened in 1890. The churchyard contains the graves of many of the victims of mountaineering. The Théodule Pass or Matterjoch (10,899 feet) leads to Aosta in Italy.

**Zero,** in comomn language, no thing; in arithmetic it is called naught, and means no number; in algebra, it stands for no quantity, or for a quantity less than any assignable quantity; a cipher; nothing, denoted by 0. In astronomy, the first point of ARIES (*q. v.*).

In the scale of a thermometer, the point (0°) from which numbers with the + sign are counted upward, and those with the — sign downward. In Fahrenheit's thermometer zero is — 32°, *i. e.*, 32 degrees below the freezing point of water. In the Centigrade and Reamur's scales zero is that freezing point itself.

**Zero, Absolute.** See ABSOLUTE.

**Zerrahn, Carl,** an American musical conductor; born in Malchow, Mecklenberg-Schwerin, Germany, July 28, 1826; came to the United States with the Germania Orchestra in 1848; became musical director of the Handel and Hayden Society of Boston in 1854; was conductor of the Harvard symphony concerts in 1866–1882; and for many years directed the famous annual musical festivals at Worcester, Mass. He edited "The Index," "The Apograph," "The Atlas," "Carl Zerrahn's Selections," etc. He died Dec. 29, 1909.

**Zerubbabel,** the son of Salathiel, and one of the family of the kings of Judah. He gained the esteem of Cyrus, King of Persia, who gave him the sacred vessels, with which he returned to Jerusalem, where he rebuilt the temple, which was dedicated in 515 B. C.

**Zesen, Philipp von** (tsā'zen), a German poet; born in Priorau near Dessau in 1619. He devoted himself to the study of philology and poetry; giving special attention to perfecting and purifying his mother tongue. Among his numerous writings in prose and verse are the novels "Adriatic Rosemund" (1645) and "Samson"; the poem "Priorau; or, The Praise of the Fatherland," as well as some excellent short verse. He died in Hamburg in 1689.

**Zeta,** a little closet or chamber; applied by some writers to the room over the porch of a Christian church, where the sexton or porter resided, and kept the church documents.

**Zethos.** See AMPHION.

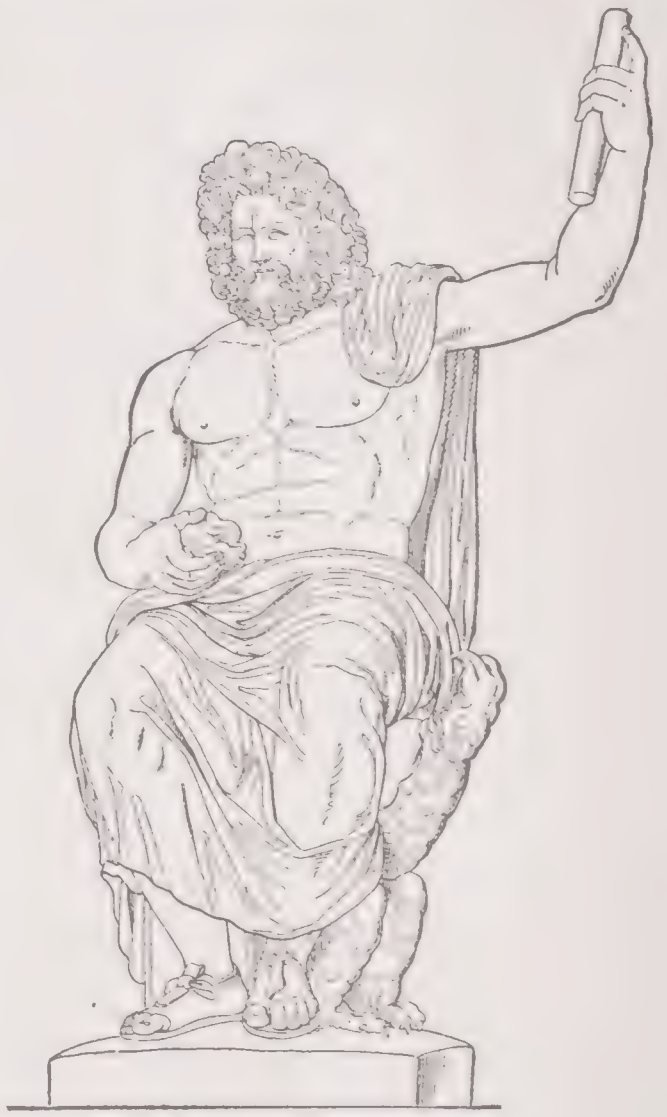
**Zeuglodon,** in palæontology, the type genus of *Zeuglodontidæ*. The remains were formerly supposed to be reptilian, and were named *Basilosaurus* by Harlan. They were renamed by Owen (who demonstrated their mammalian character), and the new name was chosen because the first section of a molar examined was taken from the base of the crown, where it was beginning to divide into the roots, and thus it looked like two single teeth yoked or linked together. The names *Phocodon* and *Phocodontia* are sometimes given to the genus and family respectively, from the seal-like character of the dentition. Several species have been found in the Eocene of the United States; and a portion of a skull in the Barton Clay (Eocene) of Hampshire, England. Also any species or individual of the *Zeuglodontia*.

**Zeugma,** in grammar, the connection of one word with two words or with two clauses, to both of which it does not equally apply; so that, for one of them, another word (to be gathered from the sense of the passage) must be mentally supplied. Zeugma is therefore a species of ellipsis; both abbreviate discourse. Where the word to be supplied is a form of another in the sentence, as, "I love you, and you [love] me," the construction is elliptical; where the sense requires a different word, as "The sun shall not burn thee by day, neither the moon [injure thee] by night" (Ps. cxxi: 6, Prayer Book), it is zeugma.

**Zeulenroda,** a town of Germany, in a detached portion of the principality of Reuss-Greiz; 10 miles W. of Greiz; has a large handsome stadtkirche, a beautiful rathhaus and hospital, with important manufactures of soap, machinery, cotton and woolen wares, especially hosiery, besides a considerable trade in cattle.

**Zeunerite** (after Professor Zeuner, of Freiberg), a tetragonal mineral, isomorphous with uranite, which it much resembles in its physical characters; hardness, 2–2.5; sp. gr. 3.2; color, grass green and apple green; composition: A hydrated arsenate of sesquioxide of uranium, and protoxide of copper. First found at the Weisser Hirsch mine, Schneeberg, Saxony.

**Zeus** (zūs), the greatest of the national deities of ancient Greece; according to the most received mythology, son of Cronos and Rhea. With the help of his brothers and sisters, Poseidon, Hades, Hestia, Hera, and Demeter, he overthrew Cronos and the Titans, assumed the sovereignty of the universe, and took as his peculiar province the heaven above, giving to Hades the infernal regions, to Poseidon the sea, the earth being left subject to the influence of all three, though to Zeus belonged the supremacy. Next him stood his sister and consort Hera, mother of Ares, Hephæstus, and Hebe. This was his rightful wife, but her position did not preclude a number of inferior marriages with other goddesses, and intrigues with mortal women, as Europa, Antiope, Callisto, Semele, Danae, Io, Leda, Alcmena, etc. Thus he swallowed his wife Metis to bring forth Athena from his own head; Themis bore him the Hours and the Fates; Eurynome, the Graces; Demeter,



ZEUS.

Persephone; Mnemosyne, the Muses; Maia, Hermes; Leto, Apollo and Artemis. Crete, Rhodes, Dodona, and Arcadia were the places where the worship of Zeus was most cultivated, but of all places Mount Olympus in Thessaly and Mount Ida in the Troad were his especial haunts. All the local cults of Zeus came gradually to be merged in one great Hellenic divinity — a process carried still further when Zeus was identified with the Jupiter of the Romans and the Ammon of Libya.

Besides the epithets of Zeus from the seats of his worship, he had many titles applied to him from his various powers and functions, moral and physical. He was the

father and king of gods and men; the protector of kings, of law and order; the savior and giver of victory; the avenger of broken oaths and of other offenses; he watched over the state, the assembly, the family, over strangers and suppliants; his hand wielded the lightnings and guided the stars; he ordained the changes of the seasons, and, in short, regulated the whole course of nature. All prophecy, too, was supposed to originate in him, and it was from him that Phœbus Apollo received his oracular gift. He dispensed, as it pleased him, both weal and woe to mortals; but whether he could control the Fates themselves is a point about which the ancients disagreed, as men have done of the supreme deity in all ages where the problems of free will and fate cross each other. Of the many epithets applied to Zeus perhaps the best known is the "Olympian," from that Olympus in Thessaly whose summit was believed to be his residence as well as that of the other gods. His most celebrated festival was the Olympic, held at Olympia, in Elis, after the end of every fourth year.

These exalted conceptions of the majesty and power of Zeus harmonize indifferently with the stories of his amours with mortals and immortals, as well as with the motives of caprice, anger, deceit freely attributed to him. Solar mythologists have made bold to explain transformations into a bull and the like as originally a poetic and symbolical realization of natural phenomena. But it may be gravely doubted if there is any foundation for these theories beyond the fact that the name (Sanskrit *Dyanus*) undoubtedly means sky. It is much more probable that Mr. Lang's theory is true — that such a mythological growth as the traditional Zeus is a confusion of myths of perverted history, of primitive physical conceptions, and elementary pantheistic speculation, added to native myths descending from a totemistic stage of culture.

**Zeuss, Johann Kaspar** (tsois), a German historian; born in Vogtendorf, Upper Franconia, July 22, 1806. Among his works are: "The Germans and the Neighbor Stocks" (1837); "The Descent of the Bavarians from the Marcomanni" (1839); "Witzenburg Traditions and Possessions" (1842); "The Free Imperial City of Spires from its Destruction" (1843); "Celtic Grammar" (2 vols. 1853), his greatest work. He died in Vogtendorf, Nov. 10, 1856.

**Zeuxis** (zūk'sis), one of the greatest Greek painters; born in one of the many cities named Heraclea, and flourished in the latter half of the 5th century B. C. He traveled a good deal, spending some time at Athens during the Peloponnesian War, visiting the court of Archelaus, King of Macedonia, and afterward Italy and Sicily. He excelled in form, light and shade, and coloring, in dramatic composition of grand subjects, and in imitation of inanimate objects. He made a large fortune, was extremely vain, and at last used to give away his pictures because he thought them worth more than any price that could be set on them. One of his most celebrated works was the picture of "Helen," painted for a temple at Croton. Five of the most beautiful girls of that city were his models for the work. Among the other famous works of Zeuxis were his "Infant Hercules strangling the Serpent"; "Female Hippocentaur"; "Zeus in the Assembly of the Gods" etc. Parrhasius was a young rival of Zeuxis, and in a competition between them was allowed by Zeuxis to surpass him. On that occasion, Zeuxis painted a bunch of grapes which birds pecked at, and Parrhasius a curtain which deceived Zeuxis.

**Zevecot, Jacob** (zā've-kot'), a Dutch poet and dramatist, considered by his contemporaries the greatest Latin poet of his time; born in Gand, in 1604. Among his works are: "Elegies"; "Greek Maria" and "Rosimunda," tragedies; "Esther," a tragi-comedy; "The Siege of Leyden" (1626), a tragedy written in Flemish; and various collections of shorter poems. He died in 1646.

**Zeyer, Julius** (zā'yer), a Czech novelist and poet; born in Prague, in 1842. After traveling extensively on the Continent, he spent several years teaching in Russia. He wrote in prose "Andrew Cernysev," a notable romance; "Miss Olympia"; "Count Xavier"; "Madrana's Adventure"; "Tales of Sosana"; "The True Friendship of Amis and Amil"; etc.; and in verse, "Vysehrad," a series of epic poems, based on Bohemian ancient history.

**Zezschwitz, Gerhard von** (tsāch'vits), a German theologian; born in Bautzen, July 2, 1825. He was a professor in the University of Erlangen. Among his numerous writings are: "The Catechisms of the Waldensians and the Bohemian Brethren" (1863); "The Mediæval Drama, from the End of the Roman Empire" (1878); "System of Practical Theology" (3 vols. 1876–1878); "Manual of the Theological Sciences" (1883); "Catechetics" (1883). He died in Erlangen, July 20, 1886.

**Zhob,** a river of Southern Afghanistan (or Northern Baluchistan) which joins the Gomul N. W. of the Suliman Mountains, and with it flows into the Indus near Dera Ismael Khan. There are valuable passes into Afghanistan both by the Gomul and the Zhob valleys — the latter of which was annexed by Great Britain in 1889.

**Zhukovski, Joukovski,** or **Shukows, Vasilii Andréevich,** a famous Russian poet; born near Bielev, province of Penza,

in 1783. He succeeded Karamzin as editor of the "Viestnik Evropui," 1808; was preceptor of the Emperor Alexander II. in his youth, as well of Alexander's mother. He wrote: "The Minstrel in the Russian Camp," a collection of spirited war ballads; "Ziudmilla"; "Svietlana," his best work; etc.; and a number of prose essays and tales, the best-known of which was "Mary's Grove." He made also numerous translations from the German, English, etc.; his translation of Gray's "Elegy" being one of the finest ever made. He died in 1852.

**Zibet,** or **Zibeth,** the *Viverra zibetha,* a Sumatran civet; length about two feet six inches, tail 11 inches; head rounded, bulging before the ears, and then rapidly contracting into a short muzzle; fur close, soft, and downy, with black and white lines on the back, and spots in transverse undulations on the back and sides; tail faintly ringed. In Travancore, in India, there was a government establishment for the rearing of these animals, the civet obtained from them being used in perfumery and in Hindu medicine.

**Ziegenbalg, Bartholomew** (tsē'gen-bälg), a German missionary; born in Pulsnitz, Lusatia, June 14, 1683; studied at Halle, and on the call of Frederick IV. of Denmark went to establish Christian missions in the then Danish colony of Tranquebar, where he arrived in 1706. He published a Tamil grammar and a Bible in Tamil. He died in Tranquebar, in February, 1719.

**Ziegler, Carl** (tsēg'lār), an Austrian poet; born in St. Martin, Upper Austria in 1812. He studied philosophy at the Vienna University, but takes high rank among modern Austrian lyrical poets, both as to substance and form. His language is simple, but the treatment of his subjects original, and full of thought and depth of emotion. He published: "Poems" (1843); "Heaven and Earth," poems (1856); "Odes" (1866); and a collection of hymns, rhapsodies, etc., many of them full of beauty and power. He died in Vienna, in 1877.

**Ziegler, Friedrich Wilhelm,** a German actor and dramatist; born in Brunswick, in 1760. He played at the Vienna Court Theater with steady success for nearly 40 years. Several of his dramas hold the stage today: as "Party Rage," and "The Four Temperaments." He wrote: "Dramatic Works" (5 vols. 1791–1794); "The Dramatic Art" (1821); "Man with Relation to the Fine Arts, Particularly the Art Dramatic" (1825); etc. He died in Vienna, in 1827.

**Ziegler, Heinrich,** a German theologian; born in Posen, May 16, 1841; studied at Berlin and Jena, and at the Wittenberg Seminarium; lectured in gymnasia at Berlin, and in 1874 was nominated Diakonus in the St. Peter-Paul church at Liegnitz, when the Consistory at Breslau opposed the nomination, which was, however, confirmed by the supreme Church Council, and in 1877 advanced to be Pastor Primarius of his church. Among his writings are "The Teaching of Irenæus" (1868); "Irenæus, Bishop of Lyons" (1871); and "The Counter Reformation in Silesia" (1888). After Kleim's decease he edited "Rome and Christianity" (1881). His five lectures, "The Spiritual Christ" (1891), solely exercised the Breslau Consistory.

**Ziegler, Theobald,** a German philosophical writer; born in Göppingen, Würtemberg, Feb. 9, 1846. He became Professor of Philosophy in the University of Strassburg in 1886. He was author of: "With Regard to Strauss's Book, The Old Faith and the New" (1874); "Text-Book of Logic" (1876); "Republic or Monarchy: Switzerland or Germany" (1877); "History of Ethics" (1881); "The Social Question a Moral Question" (1891); "The German Student at the End of the Nineteenth Century" (6th ed. 1896).

**Ziegler und Kliphausen, Heinrich Anslem von** (önt klip'hou-zen), a German romance writer; born in Radmeritz, Jan. 6, 1653. His principal work "The Asiatic Banise" (new ed. 1766), in the heroic-gallant style, has exerted great influence on the formation of the taste of several generations of Germans. He died near Leipsic, Sept. 8, 1697.

**Ziel, Ernst** (tsēl), a German poet and miscellaneous writer; born in Rostock, May 5, 1841. He was author of "Literary Rilievos: Poet Portraits" (4th series, 1885–1895).

**Zielinski, Felix** (zē-lin'ski), a Polish author; born in Volhynia, in 1732. He was marshal of the nobility for his district. He wrote: "The Old and the New Style" (1763); "Criticism of Karamsin" (1764); "A Critical Glance at Present Society" (1772); "Happy-go-Lucky Louise" (1771), humorous; "A Rustic's Mind" (1775); "Critical History of Polish Literature" (1776); "Critical Glance at the Works of Voltaire" (1782); etc. He died in Warsaw, in 1805.

**Zierikzee,** a town of the Netherlands, in the province of Zeeland, and the chief town of the island of Schouwen, 3 miles from the Ooster Schelde (with which it is connected by two canal harbors), and 21 miles E. N. E. of Flushing. It has six churches, a fine town house, and a gymnasium, manufactures madder, carries on brewing and oyster fishing, and has considerable trade and shipping. It is the oldest town of Zeeland, and

was formerly an important Hanse town. Its demolished walls are now replaced by promenades.

**Zieten,** or **Ziethen, Hans Joachim von** (tsē'ten), a Prussian military officer; born in Wustrau, Ruppin, May 14, 1699; entered the service at 15, but retired in 1724, only to rejoin in 1726. A quarrel with his captain brought him a year's imprisonment and dismissal from the service, but in 1730 he was rehabiliated. As colonel of a regi-

HANS VON ZIETEN.

ment of hussars (1741) he did much to increase the efficiency of the Prussian light cavalry. In 1744 at the head of the advanced guard he burst into Bohemia, and then executed a dexterous retreat behind the Elbe, in the course of which he beat back an attack of 16,000 men at Moldau-Tein (Oct. 12). He covered himself with glory at Hohenfriedeberg (June 4, 1745), and, throughout the Seven Years' War, at Prague, Collin, Leuthen, and Liegnitz, where he was made general of cavalry on the battlefield (Aug. 15, 1760). The victory at Torgau (Nov. 3, 1760) was in great measure due to his dash and vigor. After the peace he lived out his days in retirement at Berlin, in especial favor with the king, and died Jan. 26, 1786.

**Zif, Ziph,** or **Ziv,** in the Hebrew calendar, the second month of the year, extending from the new moon in May to that in June; or, according to some Rabbis, from the new moon in April to that of June, (I Kings vi. i: 37). In some copies of the Authorized Version, the spelling is Zif, in others Ziph; in the Revised Version Ziv, which is the correct form.

**Zimbabye,** or **Great Zimbabwe** (zēm-bäb'-wa), a notable ruin in Mashonaland; in lat. 20° 16′ 30″ S., and long. 31° 10′ 10″ E.; 3,300 feet above sea-level. It is the principal of a series of similar remains along the W. side of the Sabi river, and consists of a large elliptical building (280 feet long, with walls 35 feet high and 16 feet thick) on a gentle rise, with buildings extending into the valley, and an immensely strong labyrinthine fortress on the opposite hill, 400 feet above. The older buildings are beautiful examples of dry masonry. There are a considerable number of little images of the solar disk; whilst the two conical towers in the sacred enclosure on the lower hill, as well as the chevron ornamentation there, and various objects found in the citadel point to phallic forms of worship. The ruins evidently formed a garrison for the protection of a gold-producing race in remote antiquity, of whose work many traces have been found — a smelting furnace made of hard cement, clay crucibles with little specks of gold adhering, an ingot mold of soapstone, burnishers, crushers, carved soapstone birds, etc. Theodore Bent, who explored the ruins in 1891, assigned this enterprise to pre-Mohammedan Arabians (with possibly Phœnician influences), as both the objects of art and the special cult indicated are utterly foreign to the African races. K. Mauch would identify the region with the OPHIR (*q. v.*) of Solomon's time.

**Zimmerman, Eugene,** an American cartoonist; born in Basel, Switzerland, May 25, 1862; removed to the United States and received a public school education in Paterson, N. J.; was employed on "Puck" in 1882–1885. In the latter year he became a caricaturist for "Judge," and became well-known as a book and magazine illustrator.

**Zimmermann, Johann Georg** (tsim'-mer-män), a Swiss physician and miscellaneous writer; born in Brugg, Aargau, Switzerland, Dec. 8, 1728. At the University of Göttingen he studied under and was befriended by Haller, and eventually was appointed public physician to his native town. He became famous in his profession, and published several works on miscellaneous subjects, with one on "Experiences in Medicine," which procured him the appointment of physician for Hanover to George III. The loss of his wife and other domestic calamaties brought on an attack of hypochondria, from which a second marriage relieved him, and as a result of his recovery he produced his once celebrated treatise on "Solitude" (1784), by which out of his own country he is alone remembered. In 1786 he attended Frederick the Great in his last illness, about whom he published two works, one of them "Conversations with the King," which involved him in painful controversy. Latterly he became deranged, and died in Hanover, Oct. 7, 1795. His "Autobiography" was issued in 1791.

**Zimmermann, Karl,** a German theologian; born in Darmstadt, Aug. 23, 1803. He wrote: "Life of Luther" (2d ed. 1855); "Contributions to Comparative Homiletics" (1866); "The Evangelical Diaspora"

(1868); "The Gustavus Adolphus Society: Its History, its Constitution, and its Works" (1878). He died in Darmstadt, June 12, 1877.

**Zimmermann, Wilhelm,** a German historian; born in Stuttgart, in 1807. He studied theology at Tübingen, and occupied various posts both as a professor and as a clergyman, but devoted himself largely to general literature. He published: "Poems" (1832); a tragedy, "Masaniello" (1832); "History of Würtemberg" (1835); "German Wars of Liberation against Napoleon" (1836); "History of the Great Peasant War" (1840–1844), considered Zimmermann's best work; "History of the Poetry of All Nations" (1856); "German's Heroic Struggle" (1870–1871); and many others. He died in Mergentheim, in 1878.

**Zimmern, Helen** (tsim'mern), a German-English story writer; born in Hamburg, March 25, 1846. From childhood she lived in England. She was author of "Stories in Precious Stones" (1873); "Told by the Way" (1874); "Half-Hours with French Novelists" (1881); "Stories from Foreign Novelists" (2 ed. 1885). She wrote also "Schopenhauer, his Life and Philosophy" (1876); "G. E. Lessing, his Life and Works" (1878); "The Hansa Towns" (1889).

**Zinc,** a bluish-white lustrous metal, having a crystalline lamellar structure, moderate hardness, a somewhat low melting-point. To obtain it pure, commercial zinc, or spelter, as it is termed, is dissolved in pure dilute sulphuric acid; a cement of sulphuretted hydrogen is then passed through it, and it is filtered from any precipitate formed. The solution is then boiled to expel any sulphuretted hydrogen that may remain in it, and the zinc is precipitated in the form of carbonate by pure carbonate of soda. The carbonate is then ignited to form it into oxide of zinc, which is distilled in a porcelain retort, with charcoal prepared from loaf-sugar. Zinc is brittle at ordinary temperatures, but is possessed of considerable malleability and ductility at a temperature of between 200° and 300°, and may be wrought and rolled with ease. A little above this it becomes brittle again, and may be pulverized in a mortar. It fuses at 773°, and at a bright red heat it may be volatilized. If its vapor is exposed to the air, it burns with great splendor, becoming converted into oxide, which is deposited in loose flocculi. At the ordinary temperature it is not acted on by the air, but when exposed to moist air or oxygen, it becomes covered with a tenacious gray coating of hydrated oxide, which impedes the further oxidation of the metal beneath. In this respect zinc rust differs from iron rust, which seems to accelerate the oxidation of the adjacent metal. By the conjoint action of oxygen and carbonic acid, zinc roofing becomes converted into a mixed oxide and carbonate. When melted in the air, the oxide is formed much more rapidly. The metal is readily dissolved by the mineral and vegetable acids. Boiling solutions of potash also act on zinc, hydrogen being liberated, and oxide of zinc remaining dissolved in the alkaline solution. The difficultly oxidizable nature of zinc, its cheapness, the ease with which it is extracted from its ores, and the ready way in which it may be worked, are bringing it daily more and more into use. Neither the vapor nor its oxide is poisonous.

It is of the greatest use in the laboratory, for the precipitation of certain metals and for the formation of hydrogen. For voltaic purposes it is indispensable, and its principal alloy, brass, is too well known to need description. It forms alloys with iron and several other metals. The so-called galvanic iron is iron covered with a protective coating of zinc. It also enters into the composition of German silver. The origin of the term zinc is lost in obscurity; it was first employed by Basil Valentine, but the great Paracelsus was the first to associate the word with a metal possessing the characters of zinc. It hardly seems probable that zinc was known to the ancients. An obscure passage in Strabo seems to show that a certain stone was found to drop false silver when melted, but there is little to show that this false silver was zinc. It is possible, however, that its alloys were known to the later Romans, for numerous coins have been found containing copper and zinc nearly in the proper proportions to form brass. It was not till the beginning of the 18th century that zinc was commercially extracted from its ores in Europe. Before this, however, it was imported by the Portuguese and others from the East Indies and China, under the name of tutenag and spelter. It seems first to have been made in England by Mr. Champion, of Bristol, about the year 1743. Long before zinc was known as a metal, brass was made in large quantities by heating metallic copper imbedded in a mixture of calcined calamine and carbonaceous matter. This was effected in large crucibles, which were exposed to a long-continued heat in furnaces constructed for the purpose. The zinc immediately on its liberation from the calamine of course united with the copper without giving any notice of its presence. The only use to which zinc was applied for many years after its discovery was for mixing with copper to form brass; and it was comparatively of late years that the fact of its becoming ductile and malleable when heated was made known. A patent was granted to the discoverers of this property,

Zinc

Sylvester and Hobson, in 1805, since which period the zinc manufacture has made steady progress.

Zinc has a considerable power of dissolving iron; in consequence of which the iron pots in which it is melted soon become corroded and unfit for use. Its specific gravity varies, according to the closeness of texture of the sample, from 7.03 to 7.2, or even 7.3. Zinc is abundantly distributed in the form of various ores throughout the whole world. Its principal ores are: Red zinc ore, which is found and worked in New Jersey. It consists of oxide of zinc, colored with binoxide of manganese. Carbonate of zinc, or calamine, found extensively in the Devonian and Carboniferous formations of most countries, especially near Lancaster, Columbia co., Pa., where mines were opened in 1853. Hydrated silicate of zinc, which is worked extensively in the United States. Sulphide of zinc, blende, or black jack, which is met with in large quantities in various parts of England and Europe. In the extraction of zinc from its ores, the blende or calamine is first crushed between rollers and roasted. In the case of the blende this is a tedious process, and requires great care. The result in either case is oxide of zinc, which is mixed with half its weight of powdered coke or anthracite, and introduced into crucibles of peculiar construction. A circular furnace is employed, within which the crucibles are ranged. In the bottom of each crucible is an opening, to which a short iron pipe is attached, passing through the bottom of the furnace. To the end of this is affixed a removable tube communicating with a sheet-iron vessel. The hole in the bottom of the crucible having been partially plugged with coke, a charge of ore and coal is introduced, and the top of the crucible luted down. The tube connected with the iron vessel is lowered so as to leave the crucible tube open, and the heat is raised. So soon as the flame at the mouth of the short iron tube begins to turn from white to blue, connection is made with the tube leading to the iron pan, and the zinc gradually distils downward, partly in powder and partly in stalactitic masses. The crude metal is remelted, skimmed, and cast into ingots. In Silesia and Belgium retorts are used instead of crucibles, or per ascensum instead of per descensum. Zinc is often known in commerce as spelter, the derivation of which term is unknown. The equivalent of zinc, as determined by Erdmann, is 52.53.

Zinc only forms one oxide ZnO, which occurs in nature as red zinc ore. The anhydrous oxide is formed when zinc is burnt in air, and has been occasionally found in four and six-sided prisms in the flues of zinc furnaces. It is best prepared in the laboratory by calcining the precipitate produced by mixing solutions of sesquicarbonate of ammonia and sulphate of zinc. On the large scale, when it is required as a pigment, it is made by distilling zinc in clay retorts, passing into chambers through which a current of air is maintained. The volatilized metal burns at the high temperature to which it is exposed, and the oxide is deposited in the condensing chambers. As a pigment, it has not met with great success, as it does not wear so well as white lead, from its lesser specific gravity. In situations where it is exposed to sulphurous fumes, it stands perfectly; and being harmless in its nature, it is not open to the objections raised against its poisonous congener. Oxide of zinc forms a light white powder, which becomes yellow when heated, regaining its whiteness when it cools. It is a permanent oxide, even at the greatest heat. When exposed to the air, it becomes converted into a carbonate. It dissolves readily in acids, and its salts have the same form as those of magnesia and oxide of iron, with which it is isomorphous. Its salts, though neutral in composition, have an acid reaction. It is not easily dissolved in solutions of potash and soda, but if fused with them in a silver crucible, it forms compounds soluble in water in which the oxide of zinc appears to play the part of an acid. The hydrated oxide is formed by adding a solution of potash to the sulphate of zinc. It is readily soluble in excess of alkaline solutions. In medicine, oxide of zinc is used in ointments as an astringent and desiccant, and by itself as a tonic, especially in cases of nervous debility brought on by drinking. Zinc is said to be a binoxide, but it requires confirmation. Nitrate of zinc is prepared by dissolving zinc in dilute nitric acid. It forms deliquescent four-sided prisms, soluble in water and alcohol. Sulphate of zinc, or white vitriol, is manufactured on a large scale by roasting native sulphide of zinc (blende), extracting the mass with water, and evaporating to the crystallizing point. It is generally sent into commerce in white fused masses. Generally speaking, it contains six atoms of water of crystallization; but compounds containing less have been formed. It crystallizes ordinarily in four-sided prisms. It is used in medicine as an emetic, and very largely by calico printers. It is soluble in 2½ parts of water, but insoluble in alcohol. Several basic sulphates are said to exist. It combines directly with ammonia, forming a definite compound. It also forms double sulphates with those of potassa, ammonia, magnesia, and protoxide of iron. Carbonate of zinc, or calamine, occurs in nature in large amorphous masses, and occasionally in crystals of the same form as those of carbonate of lime. It is the chief ore of zinc, and is employed in its

impure state in medicine as an exsiccant, and in healing cerates. The anhydrous carbonate may be prepared in the laboratory by placing a tube containing carbonate of soda in a strong tube containing sulphate of zinc, sealing the outer tube hermetically, heating it to 320° F., and inverting it so that the solution may mix; crystalline grains of the anhydrous carbonate are gradually deposited. No neutral carbonate of zinc can be obtained from its salts by double decomposition. Chloride of zinc is prepared by dissolving granulated zinc in hydrochloric acid, and evaporating, when it is obtained in a semi-solid hydrated mass, known as butter of zinc. If this be further heated, it fuses, becomes anhydrous and solid. It is deliquescent, fuses easily, and may be distilled. It is remarkably soluble in water, and its strong affinity for that substance renders it of great use as a desiccating agent in organic research. In solution it forms Burnett's disinfecting fluid. It is a powerful escharotic when applied to the skin, and is used in surgery for that purpose. It fuses above 700° F., but does not decompose unless more strongly heated; hence a bath of it is sometimes used for maintaining objects at a high temperature. Its solution absorbs ammoniacal gas with avidity. It forms double salts with the chlorides of the alkaline metals. Its solution is also much used in soldering zinc, iron, and copper. Its solution is also much used for preserving objects for dissection, as it does not corrode the instruments in the same way as corrosive sublimate. Several oxychlorides are said to exist. Sulphide of zinc, or blende, is found native contaminated with a large number of the other metals. It may be prepared by the direct combination of its elements. The hydrated sulphide is obtained as a white precipitate, by adding an alkaline sulphide to a solution of some zinc salt. There are several oxysulphides of zinc. The trisilicate of zinc, or electric calamine, is found native in several parts of the world. Heat develops electricity in it; hence its name. Valerianate of zinc is used in medicine in combating nervous disorders.

The production of zinc in the United States for the year 1901 was 140,822 short tons, as compared with 123,886 tons in 1900, and with 129,051 tons in 1899. The largest gain in production was made by Kansas, with an output of 74,240 short tons, as compared with 62,136 tons in 1900; Illinois also made a considerable gain from 38,750 short tons in 1900 to 44,896 in 1901.

The average realized price for zinc in 1901 was $24.21 per short ton, as compared with $26.50 in 1900, with $38.50 in 1899, with $28.44 in 1898 and with $22.28 in 1897.

During 1901 the home consumption of spelter was very large, being estimated at 141,697 short tons, as compared with 99,400 short tons in 1900 and with 124,585 short tons in 1899. These figures show an exceptionally heavy consumption of spelter, which is reflected in the decline of exports of zinc in 1901 to 6,780,221 pounds, valued at $288,906, as compared with 44,802,577 pounds, valued at $2,217,693 in 1900, and with 13,509,316 pounds, valued at $742,521 in 1899. As heretofore, the exports went chiefly to Great Britain, the quantity being 5,167,274 pounds for 1901, as compared with 33,378,240 in 1900.

The year 1901 was one of fair prosperity for the zinc mining industry of Southwestern Missouri and Southeastern Kansas, which district maintains its position of overshadowing importance. The production of zinc ore in the Galena-Joplin district in 1901 was 256,920 short tons, valued at $6,318,249, as compared with 244,629 short tons, valued at $6,583,944 in 1900 — an increase for 1901 in quantity of 12,291 short tons, but a decrease in value of $265,695.

The imports of zinc in 1901 amounted to $76,059, as compared with $128,090 in 1900 and with $165,667 in 1899.

The world's production of spelter in 1908 was 796,832 short tons, a decline in a year of over 17,000 tons. The output of the United States, 210,424 short tons, although showing a decline because of the business depression, was a little over one-fourth of the world's production. England and Poland shared with the United States the aggregate decline, while Belgium and Germany reported increased outputs. The largest producers of primary spelter in the United States were Missouri, 123,655 short tons; Colorado, 24,885; Wisconsin, 17,538; Kansas, 8,628; and New Jersey, 6,926.

**Zincography,** an art analogous to lithography, the stone printing surface of the latter being replaced by a zinc plate. A novel method of printing facsimiles of rare prints, books, etc., from plates of polished zinc was invented in 1841 by Baldernus of Berlin. It is called Anastatic printing. A paper to be copied is wet with dilute nitric acid, and brought into intimate contact with a plate of polished zinc. The portions of the zinc plate in contact with the unprinted parts of the paper are etched by the acid, and a reversed copy of the printing is thus "set off," and presents a slight relief on the plate. The plate is then washed with a solution of gum in weak phosphoric acid which readily wets the "bitten" portions, but is repelled by the grease of the printing. A lithographic inking roller is then brought over the zinc plate, the ink being taken up by the greasy printed parts only, and an impression is obtained in the ordinary lithographic press. Paneiconography, invented by Gillot, of Paris, is a process of producing a design in relief on a

zinc plate adapted for printing in a typographical press. The design is either executed in lithographic crayon or ink by the artist, or a fresh impression of a lithograph, woodcut, or copperplate engraving is transferred to the zinc plate. The design is again inked, and powdered resin dusted over it. The zinc plate is then submitted to the action of dilute hydrochloric or sulphuric acids, which eats away and lowers the portions of the plate unprotected by resin. The operations of inking, dusting with resin, and etching are repeated till sufficient relief of the design is obtained.

**Zinc Poisoning,** a very rare condition, except by the chloride (Burnett's disinfecting fluid), which acts as a corrosive poison, like the mineral acids. Sulphate of zinc (white vitriol) is the only other salt of importance in this respect; the salt has proved fatal in a few instances. The symptoms are similar to those of poisoning by tartar emetic. Treatment: Demulcent drinks, sedatives, alcoholic stimulants, should be immediately given. A solution of the common phosphate of soda, largely diluted, is advisable. It acts as an excellent precipitant of zinc in the form of an insoluble phosphate. Opium injections may prove serviceable.

**Zinc White** (ZnO), oxide of zinc, a pigment now largely substituted for white lead as being less liable to blacken on exposure; but it has not an equal covering power.

**Zingarelli, Niccolo Antonio** (dzēn-gärel'lē), an Italian composer; born in Naples, Italy, April 4, 1752. After much success as a composer, both of operas and of sacred music, in 1804 he was appointed chapel-master of the Sistine chapel in Rome, and on refusing to compose a "Te Deum" on Napoleon I. making his son King of Rome, he was arrested and taken to Paris, but was immediately liberated and pensioned by the emperor, who was a great admirer of his music. When he died he was director of the Royal College of Music at Naples, and chapel-master of the Neapolitan Cathedral. Among his chief operas were "Montezuma" and "Romeo and Juliet." He died in Torre del Greco, May 5, 1837.

**Zingel,** the *Aspro zingel,* a species of teleostean fish allied to the perch, and found in the Danube and some other European rivers. The body is long, and the mouth is placed under the snout. There are two discontinuous dorsal fins, and the others are large. The average length of the fish is 12 inches. Another species (*A. vulgaris*) inhabits the Rhone. Both kinds are very palatable.

**Zingerle, Ignaz Vincenz** (tsing'erl-uh), an Austrian poet, nephew of Pius; born in Meran, June 6, 1825. He was made Professor of the German Language and Literature in the University of Innsbruck, in 1859. Among his poetical works are: "Primroses" (1848); "From the Alps"; "The Miller's Wife" (1853). He wrote also "Tyrolese Legends" (1850); "The Tyrol's Place in German Mediæval Literature" (1851); "Children's Stories from the Tyrol" (1852); "Alliteration in the Middle-High-German Poets" (1864); "Oswald von Walkestein" (1870). He died in Innsbruck, Sept. 17, 1892.

**Zingerle, Pius,** an Austrian Orientalist; born in Meran, March 17, 1801. He became Professor of the Arabic and Syriac Languages in the Roman University, in 1862. Among works whether written or edited by him, are: "Select Work of Ephrem Syrus, Translated from the Greek and Syriac" (6 vols. 1830–1837); "Genuine Acts of the Eastern Martyrs," from the Syriac (1836); "Roses of Mary from Damascus" (2d ed. 1865); "Life and Deeds of St. Simeon Stylites" (1855); "Syriac Chrestomathy" (1871); "Syriac Lexicon," for use with his "Chrestomathy" (1873); "Oriental Elements in German Poetry" (1862). He died Jan. 10, 1881.

**Zingiberaceæ,** gingerworts; an order of endogens, the typical one of the alliance Amomales. Aromatic herbs, with a creeping, often jointed rhizome. Stem simple, formed of the cohering bases of the leaves; leaves simple, sheathing, with a single mid-rib, from which very numerous parallel veins diverge at an acute angle and proceed to the margin; flowers generally in pairs, and lying among spathaceous bracts; calyx superior, short, tubular, three-lobed; corolla, tubular, irregular, with six segments in two whorls, the inner, morphologically viewed, being transformed sterile stamens, untransformed stamens three, two of them abortive; filament of the former not petaloid; anther, two-celled; style filiform; stigma, dilated, hollow; ovary, more or less perfectly three-celled, with the placenta in the axis; fruit, usually a capsule, three, or sometimes one celled; seeds, many. Closely akin to *Marantaceæ,* with which they were formerly combined, but differ in their two-celled anther, and in the possession of a vitellus round the embryo. Natives of the East Indies and some other tropical countries. Genera, 29; species, 247.

**Zinkeisen, Johann Wilhelm** (tsink'īzen), a German historian; born in Altenburg, April 11, 1803. He edited at Berlin the "Official Gazette" (Staats-Zeitung in 1840–1851). He wrote: "History of the Ottoman Empire in Europe" (7 vols. 1840–1863); "History of Greece" (1832–1840); etc. He died in Berlin, Jan. 5, 1863.

**Zinkenite,** a native sulphantimonite of lead, composed of 40 per cent. of sulphide of lead and 60 per cent. sulphide of anti-

mony. It occurs in several places in bright steel-gray, six-sided prisms terminated by low six-sided pyramids.

**Zintgraff, Eugen** (tsint'gräf), a German African traveler; born in Düsseldorf, Jan. 16, 1858. He spent some years in the Kongo region and in the Kamerun country, and wrote "North Kameruns: An Account of Travels in 1886–1892" (1895).

**Zinzendorf, Count Nicholas Ludwig von** (tsin'tsen-dorf), founder of the community of Moravian Brethren, or Herrnhuters; born in Dresden, May 26, 1700. After studying law at Wittenberg, and several years of foreign travel, he resolved to settle down as a Christian landowner among a pious tenantry, and while carrying out this intention he worked assiduously in coöperation with congenial friends at creating a revival of religion in the Lutheran Church. Having given an asylum on his estate to some persecuted religionists from Moravia, and built for them the village of Herrnhut, he settled among them, and by degrees established there a common worship, and a missionary and industrial organization based on the family, not on the monastic system. This association became known throughout the world as the Moravian Brethren. To the extension of its influence Zinzendorf devoted his fortune and his energies, visiting in the course of his journeys England and the United States. He died in Herrnhut, Saxony, May 9, 1760.

COUNT ZINZENDORF.

**Zion,** or **Sion,** the highest and most S. mount of Jerusalem; rising about 2,500 feet above the Mediterranean, and from 200 to 300 feet above the valleys at its base. It was separated from Akra on the N. and Moriah on the N. W. by the Valley Tyropœon; and had the valley of Gibbon on the W., that of Hinnom on the S., and that of the Kidron on the S. E. It was a fortified town of the Jebusites till subdued by David, and thenceforward was called the "City of David." A mosque near its S. brow now covers the "tomb of David" so called, most jealously guarded by the Mohammedans. This mount, together with Moriah and Ophel, was inclosed by the first wall, and fortified by citadels. On it were erected the magnificent palaces of Solomon, and long afterward those of Herod. At the present day a considerable portion of it lies outside of the modern wall on the S. "Zion," and "the daughter of Zion," are sometimes used in Scripture to denote the whole city, including especially Moriah and the Temple; and sometimes figuratively for the seat of the true Church on earth and in heaven.

**Zionism,** a name given to a scheme for the acquisition of Palestine by purchase from Turkey, with a view to establishing the Jews in the Holy Land. A Zionist Congress with this end in view opened at Basel, Aug. 29, 1897; and again Aug. 28, 1898. About 200 European delegates were present. The financial instrument of the Zionists is the Jewish Colonial Trust, Ltd., of London, capitalized at $10,000,000, of which $1,400,000 has been paid in. In the United States the Zionist organization is called the Federation of American Zionists, and has 165 affiliated societies, comprising a membership of approximately 10,000. The fourth annual convention of the Federation was held in Philadelphia, June 16–17, 1901.

**Ziphius,** a genus of whales belonging to the family of the *Rhynchoceti,* or beaked whales. Ziphius occurs in the Mediterranean Sea and South Atlantic. The snout is pointed, there is a single blow-hole, and a small dorsal fin is developed. There are no teeth in the upper jaw, but the lower jaw is provided with from one to two pairs. *Z. Sowerbiensis* is a familiar species. The average length is 16 feet.

**Zircon** ($ZrO_2$, $SiO_2$), a mineral, silicate of zirconium, originally found in Ceylon, and forming one of the gems, being met with either colorless or colored — red, brownish-green, etc. Hyacinth and jargon are varieties.

**Zirconia** ($ZrO_2$), the oxide of zircon, a hard white solid, "sticks" of which are sometimes used in the oxyhydrogen flame instead of lime.

**Zirconia Light,** an intensely brilliant light differing from the Drummond light mainly in the employment of cones of the oxide of zirconium instead of the less durable cylinders of lime. In 1867 Tessié du Motay introduced this light into Paris, and it was there employed for several years to illuminate squares and public buildings and gardens. The cones were formed of burnt zirconia kneaded into a paste with aqueous boracic acid, and hardened in iron molds at a red heat, and a mixture of oxygen and a highly carburetted gas was burnt to raise the cones to incandescence. The light was also once used as an illuminant in public places of Brussels and Vienna, and in the United States in lighthouses and public works. The construction of the Brooklyn bridge was conducted by night under the radiant light from zircon cones acted on by oxygen. This light has been practically superseded by the electric light.

**Zirconium,** Zr = 89:6; a somewhat rare metal, intermediate in many of its properties to aluminium and silicium. Its oxide, zirconia, was first prepared by Klaproth in 1789 from the mineral zircon, which is essentially a silicate of zirconium, and is found crystallized in square prismatic or octahedric crystals. Eudialyte, wöherite, fergusonite, and a few other rare minerals also contain small quantities of zirconium. Like silicum, this metal exists in three allotropic conditions, amorphous, crystalline, and graphitoidal. It burns in air only at the temperature of the oxyhydrogen flame, but ignites in chlorine gas at a red heat. It is affected slightly by ordinary acids, though readily attacked by hydrofluoric acid evolving hydrogen. Zirconia ($ZrO_2$) is prepared by fusing zircon with four times its mass of dry sodium carbonate with a little sodium hydrate, treating with hydrochloric acid to dissolve out the silica, and precipitating the impure zirconia by the addition of ammonia. When purified it forms a white powder, or hard lumps of sp. gr. 4.35 to 4.9. It forms two hydrates, having the compositions $ZrO_{2\cdot3}H_2$ and $ZrO_2.2H_2O$. Zirconia acts both as a base and an acid, but after ignition is acted upon only by hydrofluoric or strong sulphuric acid. The fluoride ($ZrF_4$) unites with other metallic fluorides forming zircofluorides which are isomorphous with the corresponding silicofluorides, stannofluorides, and titanofluorides.

**Ziska of Trocnow, John,** a Hussite leader; born of noble parents, in Trocnow, Bohemia, about 1360. He spent his youth as a page at the court of King Wenceslaus; in 1410 joined the troops that marched from Bohemia and Hungary to help the Teutonic knights against the Poles and Lithuanians; and took part in the battle of Tannenberg July 15. After this he fought in the campaigns of the Hungarians against the Turks, and on the side of the English against the French, especially distinguishing himself at Agincourt (1415). On his return to Bohemia, he attached himself to the extreme party of the Hussites, who under his leadership quickly became trained soldiers, and learned to fortify their camps by "Wagenburgen," *i. e.*, wagons so placed as to form defensive squares. In 1421 he founded a fortress on Mount Tabor, on July 14 of that year he defeated the German crusading army on the mountain ever since called Ziskaberg, and in January, 1422, he decisively defeated Siegmund in the battle of Böhmisch-Brod. At the head of the Taborites Ziska then advanced against the moderate Calixtines, whose possessions he ravaged in the most wanton manner. Though at the siege of the Castle of Raby in 1421 he lost his second eye, he still continued not only to order the march, following his officers' descriptions of the ground, but to direct in battle his "invincible legion of brothers." The emperor had already begun to despair of success in the contest, and had opened negotiations with Ziska, promising full liberty of conscience, when the latter died, during the siege of Przibislaw, Oct. 11, 1424. He was buried in the Church of SS. Peter and Paul at Czaslau, with his battle axe suspended above his grave. In 1623 the tomb was opened by imperial command, and his bones removed to Vienna. Ziska was an able commander, quick in thought and action, of great presence of mind, and of iron firmness, a merciless opponent of the enemies of his country and his faith.

**Zirknitz,** or **Czirknicz** (tsirk'nits), a lake of Austria; in Carniola, 30 miles E. N. E. of Trieste; about 5 miles long and between 2 and 3 broad, without surface outlet. It is remarkable for the occasional disappearance of its waters for weeks and even months, during which its bottom is often covered with luxuriant herbage. Its bed is composed of limestone, and full of deep fissures and caverns through which the waters disappear, returning when the rain sets in.

**Zitelmann, Konrad** (tsē'tel-män), a German poet and novelist; born in Stettin, in 1854. He studied law at Leipsic, but was obliged to settle in Southern Europe on account of ill health. He published the collections of poems "In Solitude" (1876); "Autumn Days in Meran" (1876), and "From Foreign Lands" (1889); the novels "At Dawn" (1880); "Gods and Idols" (1884); "The Game is Over," "Obscure Lives" (1886), and "Chords and Discords," a collection of short stories (1888); etc.

**Zither** (tsit'ur), or **Zithern** (tsit'urn), a development of the musical instrument known to the Greeks as cithara. In the early part of the 19th century it became a favorite with the peasantry of the Styrian and Bavarian Alps, and was introduced into England about 1850, chiefly by Herr Curt Schulz. The zither consists of a resonance box, with a large circular sound hole near the middle; the strings, 32 in number, in some cases increased to 40 and even 46, being made of steel, brass, catgut, and silk covered with fine silver or copper wire, and tuned by pegs at one end. Five of the strings are stretched over a fretted keyboard, and are used to play the melody, the fingers of the left hand stopping the strings on the frets, the right-hand thumb, armed with a metal ring, striking the strings, which are tuned in fifths, and have a chromatic range from c in the second space of the bass staff to d in the sixth ledger line above the treble. The remainder, called the accompaniment strings, are struck by the first three fingers of the right hand, and, as they are not stopped, produce only the single note to which they are tuned.

While playing, the performer rests the instrument on a table with the keyboard side nearest to him. The viola zither, in which the resonance box is heart-shaped, is tuned like the violin, and is played with a bow. The form of the instrument is like that of the viola, but the body rests on the lap of the seated player, while the head is placed on the edge of a table.

**Zittau** (tsit'tou), a town of Saxony; on the Mandau, near its junction with the Neisse; is an important railway center, 21 miles S. S. E. of Libau and 21 S. S. W. of Görlitz. The chief buildings are the Church of St. John and the Byzantine Rathhaus. Zittau stands in the center of a district rich in lignite, and in its neighborhood are a group of busy manufacturing villages. It is also the center of the linen and damask industry of Saxony, and has manufactures of woolens, besides bleachfields, dye works, and iron foundries. Pop. (1905) 34,719.

**Zittel, Emil** (tsit'tel), a German theological writer; born in Lorrach, Baden, Aug. 14, 1831. He wrote: "All around the Jungrau: A Tourist's Notes" (1874); "Dr. Martin Luther, 1483–1517" (1883); "The Origin of the Bible" (1891); "Bible Knowledge" (11th ed. 1893); "How Jesus of Nazareth Became the Messiah or Christ" (1893); "The Writings of the New Testament Translated and Explained for the German People" (1894).

**Zittel, Karl Alfred,** a German geologist and palæontologist; born in Bahlingen, Sept. 25, 1839. He became professor in the University of Munich in 1866. He was author of "Travels in Sweden and Norway" (1860); "From Primordial Times" (2d ed. 1875; "Letters from the Libyan Desert"; "The Sahara." He died Jan. 6, 1904.

**Ziver Pasha** (zē-ver' pä-shä'), a Turkish poet; born in 1793. He was director of the Ministry of Marine, member of the Council of Public Instruction, member of the Council of State and Justice, etc.; and became, a year before his death, a functionary of the first rank. He held the title of imperial poet; his poetry is highly esteemed by the Turks. A collection of it was published at Constantinople, under the title of the "Divan." He died in 1862.

**Zizania,** a genus of plants, order *Graminaceæ*, the most interesting species of which is *Z. aquatica*, the Indian rice or Canada rice, found in the United States and Canada or inundated shores of ponds and rivers. Its fruit, which is very abundant, affords sustenance to wild geese, ducks, and other water fowl.

**Zizyphus,** a genus of *Rhamnaceæ*, shrubs or small trees, with spiny stipules, alternate three-nerved leaves, a spreading five-cleft calyx, five hood-like petals, five stamens, a five-angled disk, adhering to the tube of the calyx, and having inclosed within it the two to three celled ovary. Fruit berry-like, the stone or kernel with two or three cells, and a single flattened seed in each. Widely distributed, but having their metropolis in the sub-tropical parts of the Eastern Hemisphere. The berries of *Z. jujuba*, the Indian plum, cultivated throughout India and Burma, are eaten both by Europeans and natives. They are called jujubes, and are of a mucilaginous, mawkish taste, *Z. vulgaris*, wild in the Punjab, and cultivated in Bengal, also furnishes some of the jujubes of commerce. The fruits of *Z. nummularia*, *Z. rugosa*, and *Z. œnoplia* are also eaten in India, but are inferior to the genuine jujubes. The fruit of *Z. joazeira* is eaten like jujubes in Brazil. *Z. lotus* is by some believed to be the lote tree or lote bush, the fruit of which produced such effect on the classical lotophagi. It grows in Barbary, where it is called *sadr*, and its berries, which are collected for food, *nabk*. The negroes of the Gambia prepare a wine from the fermented berries of *Z. orthacanthus*. The fruit of *Z. nummularia*, which grows in India, is considered to be cool and astringent, and it is given in bilious disorders. The bark of *Z. jujuba* is said to be a remedy for diarrhœa; the root in decoction is given in fever, and, powdered, is applied to sores. In the Himalaya districts the bark is used as a tan and dye-stuff. The bark of *Z. xylopyra*, a large scrambling shrub found in the hilly parts of India, is also used for tanning and for dyeing black. The root of *Z. napeca* is given as a remedy in windy colic. *Z. jujuba*, *Z. nummularia*, *Z. rugosa*, and *Z. vulgaris*, yield a gum. A decoction of the leaves of *Z. glabrata* is said to purify the blood. The dried fruits of *Z. vulgaris* are considered suppurative, expectorant, and fitted to purify the blood. The bark is used as an application to wounds and sores. The kernels of *Z. soporiferus* are regarded by the Chinese as soporific. The bark of *Z. joazeiro* is bitter, astringent, somewhat acrid, and tends to produce sickness. *Z. baclei*, from the Gambia, is believed to be poisonous.

**Zlatoust,** or **Slatoust,** a town of Russia in the province of Ufa; on the Ai, an affluent of the Ufa, and near the Ural Mountains; 150 miles N. E. of Ufa. In the vicinity are rich iron and gold mines. Zlatoust manufactures sword blades and other steel fabrics.

**Zmaj.** See JOVANOVIC, JOVAN.

**Zmeinogorsk** ("snake mountain"), a mining town of Asiatic Russia, in the province of Tomsk, with silver, copper, lead, and iron mines.

**Znaim,** a town of Moravia, Austria, on the Thaya; 50 miles N. by W. of Vienna.

It has a Rathhaus (1446), a circular church, said to have been a heathen temple, and the Gothic Church of St. Nicolas. The old ducal castle crowns a neighboring height. The trade is largely agricultural. Mustard, wine, and cucumbers are exported, and there are large potteries, at which fine majolica is produced. Leather and chocolate are also manufactured. New waterworks were opened in 1877. Formerly ZNOIMO, under which name it was the capital of Moravia, Znaim, was destroyed in 1145 by the Bohemian Prince Vladislav, but was rebuilt in 1226. On July 11, 1809, the French under Massena and Marmont defeated the Austrians here, and from July 13 to Sept. 3, 1866, it was held by the Prussians.

**Zoan.** See TAINS.

**Zoantharia,** in zoölogy and palæontology, an order of the class Actinozoa, having the chambers and tentacles generally six in number, or constituting some multiple of six, however largely they may be increased. The zoantharia are divided into three sections, according to the character of the skeletal structure: (1) *Z. malacodermata,* containing the sea-anemones and their allies. There are three families: *Actinidæ, Hyanthidæ,* and *Zoanthidæ.* The group is cosmopolitan, and preëminently characteristic of the littoral and laminarian zones, very few forms extending to 500 fathoms, and but one genus being pelagic. They have left no trace in time. (2) *Z. Sclerobasica;* black corals, principally from the warmer seas, but found at various points in the North Atlantic, and recorded from Greenland; depth from four to several hundred fathoms. (3) *Z. Sclerodermata.*

**Zoarces,** a genus of acanthropterygious fishes, family *Gobidæ,* distinguished by an elongated body, dorsal, anal, and caudal united, and no spinous rays in the dorsal, except in its posterior part. The eel-shaped blenny, or eel-pout, *Z. anguillaris,* is from 24 to 36 inches long, dark olive-brown, varied with dusky blotches. It is caught in fishing for cod.

**Zöckler, Otto** (tsuhk'ler), a German theologian; born in Grünberg, Upper Hesse, May 27, 1833. He was appointed Professor of Theology in the University of Greifswald, 1866. Among his numerous works are: "Natural Theology" (1860); "Critical History of Asceticism" (1863), afterward rewritten and entitled "Asceticism and Monasticism" (1897); "The Augsburg Confession as the Fundamental Symbol of the German Church of the Reformation" (1870); "God's Witnesses in the Kingdom of Nature" (1881); "The Apocrypha of the Old Testament" (1891).

**Zodiac,** in astronomy. The zone or broad belt of constellations which the sun traverses during the year in passing around the ecliptic. The moon and major planets also move within the same area. The breadth of the zodiac is about eight and a half degrees on each side of the ecliptic, or 17 in all. It is inclined to the equinoctial at an angle of 23° 28′, the points of intersection being reached by the sun, one at the vernal and the other at the autumnal equinox. The great circle of the zodiac was divided by the ancients into 12 equal portions called signs. They were named from the constellations then adjacent to them in the following order: Aries, the Ram; Taurus, the Bull, Gemini, the Twins; Cancer, the Crab; Leo, the Lion; Virgo, the Virgin; Libra, the Balance; Scorpio, the Scorpion; Sagittarius, the Archer; Capricornus, the Goat; Aquarius, the Waterbearer; and Pisces, the Fishes. The sun formerly entered Aries on March 20; now, owing to the precession of the equinoxes, the point of the heavens intersected by the celestial equator and the ecliptic, technically called the first point of Aries, has moved well into Pisces.

**Zodiacal Light,** a pearly glow spreading over a portion of the sky near the point at which the sun is just about to rise in the morning, or has just set in the evening. It extends from the horizon to a considerable distance toward the zenith, and is best seen in the tropics in spring evenings, about the time of the vernal equinox. In the latitude of London it is seen chiefly in the W. part of the sky in early spring after the evening twilight, and at the close of autumn before daybreak in the E. horizon. The generally accepted theory of the zodiacal light is that it consists of a continuous disk, whether of meteors or any other substance, in which the sun is central.

**Zoe** (zō′ē), Empress of the East; daughter of Constantine IX.; became the wife of Romanus III. in 1028, when she was in the 48th year of her age. She was a debauched woman, and became the murderess of her husband, in order to place her lover on the throne, who reigned under the title of Michel IV. The latter dying, was succeeded by his nephew, Michel V., who was deposed by the people, and Zoe and her sister Theodora proclaimed joint sovereigns. She displayed great ability and firmness in the government, and in 1042 married Constantine Mononachus. She reigned till her death at the age of ; in 1052.

**Zoea,** in zoölogy, a pseudo-genus of *Crustacea,* founded on the larvæ of some of the higher forms. There is a cephalo-thoracic shield, often provided with long spiniform processes, the longest of which project upward from the middle of the back; the tail region is developed, but without appendages; lateral eyes are present in addition to the median eyes.

**Zoega, Johann George,** a Danish archæologist and Coptic scholar; born in Jutland, Dec. 20, 1755; studied at Göttingen; and finally settled at Rome, where he turned Roman Catholic. He wrote on Egyptian coins and Roman bas-reliefs, and made a great catalogue of Coptic MSS. He died Feb. 10, 1809.

**Zoetrope,** a mechanical toy, depending, like the thaumatrope, for its interest on the constancy of visual impressions. It consists of a rotating drum, open at the top, in which around its inner periphery, are placed strips of paper, having figures of men, animals, etc., in varying positions. By turning the cylinder the images are seen through slots in its upper side, giving the effect of action to the figures. For instance, a clown jumping through a hoop is represented in perhaps a dozen different positions. The turning of the drum brings into view, in rapid succession, these varying positions till they blend into a perfect image full of motion, and operating to simulate natural action. A man sawing wood, an animal kicking, an acrobat playing with clubs, may be thus shown in apparent motion.

**Zogbaum, Rufus Fairchild,** an American artist; born in Charleston, S. C., Aug. 28, 1849. He was educated in New York; studied abroad; was successful as a painter of military scenes and as a book and magazine illustrator of military subjects; and wrote: "Horse, Foot, and Dragoons; or, Sketches of Army Life"; "All Hands"; "Ships and Sailors."

**Zogoskin** (zo-gos'kin), or **Zagoskin, Sagoskin, Mikhail** (zä-gos'kin), a Russian novelist and dramatist; born in the province of Penza, in 1789. His chief work is "The Russians in 1812" (1829). His historical novels have earned for him the name of the Russian Walter Scott. He died in Moscow, in 1852.

**Zohar** (Hebrew, splendor), a Jewish book, highly esteemed by the rabbis, and supposed to be of great, though altogether unascertained, antiquity. It consists of cabalistical commentaries on Scripture, especially on the Pentateuch. It has been translated into Latin (ed. 1680).

**Zoilus,** a rhetorician of ancient Greece, born in Amphipolis, chiefly remembered for the asperity of his criticisms on the poems of Homer. The time at which he lived is probably the 3d century B. C. His name is used proverbially as that of a captious or snarling critic.

**Zoisite** (after Baron von Zois), an orthorhombic mineral formerly regarded as a variety of epidote, but now shown to be a distinct species; hardness, 6–6.5; sp. gr., 3.11–3.38; luster, pearly on cleavage faces, vitreous elsewhere; color, shades of gray, apple green, peach blossom to rose red. Composition: Silica, 39.9; alumina, 22.8; lime, 37.3 = 100, whence the formula $2(\frac{1}{3}CaO + \frac{2}{3}Al_2O_3)3SiO_2$ Dana divides as follows: A. Lime-zoisite, (1) ordinary, colors gray to white and brown, (2) rose-red or thulite; B. Lime-soda-zoisite, which includes Saussurite in part.

**Zola, Emile,** a French novelist; born in Paris, France, April 2, 1840; the son of an Italian engineer. After working for Paris publishers and writing for the press he attempted fiction with success. He first appeared as a novelist in "The Mysteries of Marseilles." "Thérèse Raquin" further exhibited his remarkable power of critical analysis of human nature. "L'Assommoir," perhaps his most popular work, has gone through 50 editions. Author of "Nana," "Pot Bouillé," "The Earth," "The Human Brute," and other works. M. Zola was appointed a Knight of the Legion of Honor in 1888, and elected (April, 1891) President of the Society of Men of Letters. In 1892 he published "The Downfall," and "Doctor Pascal" in June, 1893. This book was the final volume of the famous Rougon Macquart series of 20 volumes, and was dedicated to the memory of M. Zola's mother and to his wife. During 1894 he published "Lourdes," a love story, set in the scenery of the famous resort of French pilgrims. "Rome" followed in 1896, "Paris" in 1897, and "Fecundity" in 1899. During 1897 and 1898 he took up with splendid courage the cause of Captain Dreyfus, whom he declared to have been illegally condemned, and was in consequence of his action prosecuted by order of the French government, and condemned to imprisonment. He escaped punishment by voluntary exile in England. Returning to Paris after the subsidence of the excitement caused by the Dreyfus case, he resumed his literary work, but lived only till Sept. 28, 1902, when he was accidentally killed by gas escaping from a coal fire.

Zola had the tastes of a Venetian magnifico and the capacity of a French peasant for hard work from year's end to year's end. But this feature in his character would have been more than neutralized by a natural dreaminess which made him love idleness. Had his lot been cast in Italy he perhaps would have given way to this tendency. But, surrounded by the most active class of a very active nation, and in childhood and youth in the blackest poverty, he made up his mind to seek safety and renown in laborious daily application to the tasks he had set before him. One may read in "La Joie de Vivre" an account of what he might have been if he had not on entering life adopted this rule of conduct. Lazare, in whom he sees the predominance of the defective sides of his own character, is a dreamer who never finishes anything, and proceeds continuously on the downward grade of degeneration. He

butterflies from one to another notion, idea, or scheme, which as long as it holds his mind, possesses it completely. Lazare has talent and even genius, but his insurmountable aversion to drudgery prevents him turning it to any account. Zola was not long in seeing that the cultivation of habits of hard work at fixed hours of the day could discipline his mind and turn his dreaminess into creativeness. The regular hours he had to keep at the customs office, where he had a salary of 60 francs a month, and then at Hatchette's facilitated the character-education that he determined to give himself. He rose in summer at six and in winter at seven, began the task he had mapped out for the day at eight and remained writing till noon. The rest of the day he spent in his garden when in the country, in rowing on the Seine which flowed by his garden, in walks, in cycling and in snapshotting. Friends, literary chums generally, often came down unceremoniously from Paris to dine. Some of them stayed to sleep. But the lights were out at eleven o'clock, for to write well he found it necessary to sleep well.

Zola never liked society and greatly disliked coquettish fashionable ladies. In the whole course of his long career he was not at twenty dinner parties, save those given in compliment to him by his publishers, Charpentier and Frasquelle, and the composer Bruneau, for whom he promised to write a libretto in 1903. Huysmans fell away from Zola's Thursday evenings on being converted. De Maupassant, Paul Alexis and Ceard are no more. The engraver Desmoulin, Théodore Duret, Octave Mirabeau, Drs. Larat and Fleury, and Alfred Bruneau gathered round him and Mme. Zola when they last received on a Thursday evening. Conversation in which Zola joined, but not as an autocrat, went on freely. At 10:30 o'clock weak tea, Rheims biscuit and jugs of water were handed round. By eleven o'clock all the guests had disappeared.

Zola instinctively understood in things material that order is heaven's first law. His orderliness was never at fault. He could put his hand in the dark on any book that he wanted. The newspaper cuttings, with the help of which he pegged out plots for novels or invented characters, were classified in subjects or as casting light on subjects. He found the Rougon Macquarts in the account of a family near St. Malo, whose different members, whatever might be their circumstances, irresistibly gravitated toward crime.

It was easy to get on with Zola, who had unaffected, simple manners and said what he thought in a natural way without blunt frankness. He became sensitive to public opinion as age crept on, but in earlier life really cared little what people thought or said about him. He hardly ever read criticisms on his works.

When one saw Zola in a knickerbocker suit on a cycle, one felt astonished at his powerful build and well-knit, muscular figure. One then saw that he had shoulders and thews made to bear great burdens. Maupassant said of Zola: "He alone could have the courage to heap mixen on mixen behind the stables of Augeas."

Zola's hands were handy. Like most French boys brought up by poor widowed mothers he had to work a great deal with his hands, and to make himself useful in all directions. He could use carpenters' tools with skill, knit socks, darn, launder, mend a trunk, hang curtains and liked to clean his cycle. The long, thin, nervous hands with knotty joints were those of a craftsman. The long thumb formed, when he pressed it against anything, "a soldier's saddle." Zola inherited it from his mother's side of the house.

His countenance had no striking feature save the compact though large forehead which had peculiar wrinkles that might express weariness or bewilderment, and that at any rate did not express concentration or force of character. Three horizontal wrinkles ran across the middle of the forehead and two short vertical ones started from the bridge of the retroussé nose. This peculiarity gave one sometimes the impression of his being in a quandary and feeling wretched. There was nothing of "the poet's eye in a fine frenzy rolling." It is probable that his exaggerated vision of the beastliness of human nature weighed upon him. He had no sense of humor, no feeling of what is comic in life, to comfort him.

Zola was not a reader, and it may be questioned whether he was a thinker. But unquestionably he was a prodigiously great artist. Brought up among his mother's people, he never learned that it is not always good to call a spade a spade, and that sewers had best be covered. But the pen was grosser than the tongue and one could find nothing of the apocalyptic glow of his works in his conversation which was always quiet.

Zola was childless, but he used to see in the country on Sundays two boys who were spoken of as being adopted by Zola, and who lived 6 miles off with their mother. The greater part of the fortune left by Zola consisted of life insurance, of which he carried a large amount.

**Zollars, Ely Vaughan,** an American educator; born in Lower Salem, O., Sept. 17, 1847; was graduated at Bethany College in 1875; was president of the Kentucky Classical and Business College in 1877–1884 and of the Gerrard Female College in 1884–1885; pastor of the Church of Christ, Springfield, Ill., in 1855–1888; and became president of Hiram College in 1888. He wrote "Bible Geography"; "The Great Salvation"; "The Holy Book and Sacred Day"; "Hebrew Prophecy"; etc.

**Zöller, Hugo** (tsuhl'ler), a German journalist; born in Oberhausen, Prussia, Jan. 12, 1852. He was for a number of years traveling correspondent of the "Cologne Gazette," and explored and annexed to Germany various tracts of country in West Africa (1884–1885). He wrote: "Round the World" (1881); "The Panama Canal" (1882); "The Germans in the Brazilian Primeval Forest" (1883); "Pampas and Andes" (1884); "The German Possessions on the West African Coast" (1885); "German New Guinea" (1891); etc.

**Zolling, Théophile** (tsō'ling), an Italian author; born near Naples, Italy, in 1849. He was educated in German Switzerland, studied history and philosophy in Vienna, and afterward lived in Paris and Berlin. He is known as a lyrical poet, but also wrote a satirical epic poem, "The Virgin of the Chair" (1876); a drama in collaboration with Alphonse Daudet, "New Love" (1877); the novels "Gossip" (1889), and "Madame Love" (1889); etc.

**Zöllner, Johann Karl Friedrich** (tsuhl'ner), a German astronomer; born in Berlin, Nov. 8, 1834. He was Professor of Physical Astronomy in the University of Leipsic. He wrote: "Outlines of a General Photometry of the Heavens" (1861); "Photometric Researches with special relation to the Physical Constitution of the Heavenly Bodies" (1865); "The Nature of the Comets" (1871); "Principles of an Electro-dynamic Theory of Matter" (1876). In his latter years he turned to the study of spiritism and hypnotism; after his death appeared his work "Are There Unconscious and Hereditarily Transmitted Ideas?" (1879). He died in Leipsic, April 25, 1882.

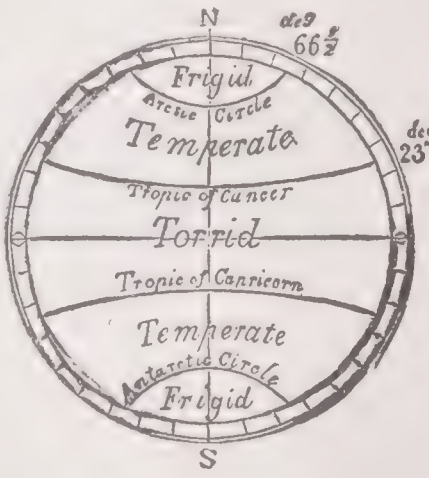
**Zollverein** (tsōl'fer-īn), the German commercial or customs union, founded originally in 1827, but extended greatly after the war of 1866, when, owing to political considerations, Prussia obtained a preponderating influence in the union, which included the North German Bund, Bavaria, Würtemberg, Baden, Hesse, and Luxemburg. This arrangement was brought prematurely to an end by the formation of the German empire. By article 33 of the constitution of the empire, the territory of the Zollverein coincides with the territories of the empire, with the exceptions of the free ports of Hamburg, Altona, Bremen, Bremerhaven, Geestemünde, and Braahe, and some communes of the grand-duchy of Baden, while Luxemburg and the Austrian canton of Jungholz are included in it. Its object is the regulation of a uniform rate of customs duties throughout the various states comprised in the union. The free ports were included in the Zollverein in October, 1888. Hence, any commercial or customs union.

**Zollogub, Sollogub** (zol'lō-göb), **Zollohub** (zol'lō-höb), **Vladimir Alexandrovich,** a Russian author; born in St. Petersburg, Russia, about 1815. Besides poems, essays, and dramas, he wrote a novel, "Tarantas," translated into English and German. He died June 16, 1882.

**Zombor,** or **Sombor,** a town of the Hungarian comitat of Bács-Bodrog; on the Baczer or Franzens canal, which unites the Theiss with the Danube; 65 miles S. W. of Szegedin. It has two Greek churches, a magnificent town house, and a public library, and carries on manufactures of silk. There is a large trade in cattle and corn. Pop. (1890) 26,435.

**Zonaras, Joannes,** a Byzantine historian; flourished in the 12th century. His chief work is the "Chronicle," a history extending from the creation of the world to A. D. 1118. Of the events of his own time his account is meager, but his works contain valuable fragments from lost writings of earlier historians.

**Zone,** in anatomy, a region of the body formed by imaginary lines drawn around it transversely; used specifically, of the abdominal zones or regions. In biology, a stripe or belt, as of color, on a plant, a shell, etc. Also a certain stratum of sea water, the depth of the upper and under surfaces of which are generally measured or calculated in fathoms. There are five zones to mark the bathymetric distribution of marine animals. Some of them are named from the distribution of sea plants, which also they mark:



ZONES OF THE EARTH.

The Littoral Zone, between tide marks; the Laminarian Zone, from low water to 15 fathoms; the Coralline Zone, from 15 to 50 fathoms; the Deep-Sea Coral Zone, 50 to 100 fathoms; the Abyssal Zone, beyond 100 fathoms.

In geography, one of five imaginary belts surrounding the earth. They are the North Frigid Zone, between the North Pole and the Arctic Circle; the North Temperate Zone, between the Arctic Circle and the Tropic of Cancer; the Torrid Zone, between the Tropic of Cancer and the Tropic of Capricorn; the South Temperate Zone, between the Tropic of Capricorn and the Antarctic Circle; and the South Frigid Zone, between the Antarctic Circle and the South Pole.

In geology, zones are particular beds in the stages or divisions of certain geological formations, as, the primordial zone. In

mathematics, the portion of the surface of a sphere included between two parallel planes. Ciliary zone, in anatomy, a term for the appearance which the pigment between the ciliary processes leaves on the hyaloid membrane, like the disk of a flower; also called *Corona ciliaris*. Isothermal zone, in geography and metereology, the space between two isothermal lines.

**Zonuridæ,** in zoölogy, a family of *Brevilinguia*, with 15 genera containing 52 species. Their distribution is remarkable; more than half the family come from South Africa, others are from Madagascar, America (from Mexico to British Columbia), and three of the genera form a distinct subgroup — the glass snakes — from North Africa, North America, the S. E. of Europe, and the Khasya Hills. The family contains forms which have the shape of lizards, and others which are serpentiform. Head pyramidal or depressed; body covered with scales in cross bands; sides with distinct longitudinal fold; limbs four, strong, entirely wanting, or concealed beneath the skin; ears distinct, eyelids present.

**Zonurus,** in zoölogy, the type genus of *Zonuridæ*, with several species, from the S. and E. of Africa and Madagascar.



ROUGH-TAILED ZONURUS.

**Zoögyroscope,** an amplification of the Zoetrope (*q. v.*) in which a series of successive instantaneous photographs of an animal in motion are placed on a circular rotating glass, the photographs being alternately illuminated by an oxyhydrogen lantern, as the glass turns, throwing a single, continuous everchanging picture on a screen. Though the separate photographs show the successive positions of an animal in motion — for instance, a horse, in making a single stride — the zoögyroscope throws on the screen a vivid presentment of a moving animal.

**Zoöid,** in biology, an animal organism not independently developed from a fertilized ovum, but derived from a preceding individual by the process of fission or gemmation. Specially applicable to the *Infusoria*, and other *Protozoa*, and to the component members of all stock-building communities, such as polypes, corals, and polyzoa.

**Zoölatry,** animal worship; adoration paid by man to any of the lower animals. This cultus seems to have passed through three stages: (1) The animal was reverenced and propitiated as possessing a power greater than that of man. (2) The animal was regarded as an incarnation of some deity or spirit. (3) It was raised to the position of a tribal ancestor. In the early history of the human race zoölatry of some kind was very prevalent. Traces of it appear in the Bible, as in the story of the Golden Calf made by the Israelites (Exod. xxxii). Zoölatry took deep root in the religious life of the ancient Egyptians, and all three forms flourished among that people. Juvenal opens his 15th satire with a scathing invective of Egyptian zoölatry, and detailed accounts of it occur in Herodotus, Plutarch, Strabo, and Cicero. In classic times the chief form of zoölatry was serpent worship, though traces of other forms occur in the transformation myths of the poets. In the present day zoölatry survives chiefly in India, among the snake-worshipers of the W. coast of Africa, and the Red Indians of North America.

**Zoölogical Garden,** a public garden in which a collection of animals is kept. The gardens of the Zoölogical Society, Regent's Park, London (familiarly termed "the Zoo"), founded in 1828, are probably the finest of the kind in the world. They belong to the Zoölogical Society of London, which was founded in 1826. Of the other chief zoölogical gardens, the Jardin des Plantes in Paris is the oldest, having been founded in 1794. There are in the United States six zoölgical gardens — at New York, Philadelphia, Cincinnati, Chicago, St. Louis, and San Francisco. The S. E. section of Bronx Park (654 acres), New York, comprising 261 acres, is in charge of the New York Zoölogical Society, who are developing there the most extensive zoölogical garden in the country, containing 55 different series of buildings, cages, and ranges.

**Zoölogical Society,** a society for the prosecution of zoölogical research; specifically, the Zoölogical Society of London, founded in 1826 by a body of scientists, among whom Sir Stamford Raffles and Sir Humphry Davy, Bart., were especially prominent, "for the advancement of Zoölogy and Animal Physiology, and for the introduction of new and curious subjects of the Animal Kingdom." See Zoölogical Garden.

**Zoölogy,** that portion of natural history which treats of the classification, structure, habits and habitations of animals. Closely related to zoölogy is the study of embryology, while comparative anatomy and physiology are the branches which dominate the study of the physical structure of man. Living matter, or bioplasm, may be considered physically as a peculiar compound of the chemical elements — carbon, oxygen, nitrogen, and hydrogen, called by Mulder proteine, and by Huxley and the German histologists protoplasm, or the physical

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basis of life. It is nearly identical with albumen. So far as is known, this combination of elements is always the product of preëxisting living matter. The term bioplasm is well applied to express matter in its living state, while protoplasm should be restricted to the material itself. Bioplasm is a semi-fluid substance, yet it will not freeze at 32° F., as water does, proving that, in this respect, at least, it is different from water. If we consider their origin, both animals and plants begin life as a small particle of bioplasm. In plants this forms an ovule, with wall of cellulose; in animals it becomes an ovum or egg, with a wall of albuminous matter.

Two theories divide the learned world respecting the genesis of living things; the doctrine of parentage, or the descent from living creatures each created "after its kind," and the theory of spontaneous generation of the living from the non-living, and the transmutation of one kind of living beings into another. The word evolution, meaning "to unfold," may be used to express the life history of individuals or of species. There is nothing new in the modern doctrine of evolution. Among the Greeks Leucippus, Democritus, and Epicurus taught that all forms and phenomena came from the spontaneous motion of atoms, and this view, in all probability, was a product of older Indian pantheism. Modern upholders of transmutation differ from each other greatly in the details of the theory. Some teach the self-elevation of species by appatency, or desire, use, and effort. Others, as Darwin, Haeckel, and many late writers, teach what is called natural selection, or the survival of the fittest. Others again, as Draper and Spencer, teach modification of species by the surrounding conditions. Some evolutionists teach a preordained succession, under an internal force or innate tendency, or evolution by unconscious intelligence. In opposition to these views some naturalists hold to the doctrine of parentage, and deny the change or transmutation of species, though admitting a certain amount of physical variability, producing races or varieties. Among these may be named Linnæus, Cuvier, Agassiz, Dana, Guyot, McCosh, Balfour, Dawson, Milne-Edwards, and Seelye. Parentage is of two kinds, sexual and non-sexual. In the first we sometimes find the sexes distinct, as in the higher animals, and sometimes united in the same individual, as in the stamens and pistils of most flowers, and as in some animal forms. Non-sexual generation is seen mostly in the simpler forms of animal and vegetable life.

For convenience of study we have what is known as classification in both the animal and the vegetable kingdoms. Thus an order is a group of families or genera related to one another by a common structure. Thus cats, dogs, hyenas, and bears are linked together, since their teeth, stomach, and claws show the carnivorous habits of the order *Carnivora.* A family or tribe does not allude to the progeny of a known stock, but refers to a group of genera having similarity of form. The term was first introduced into botany in France in connection with what is called the "natural system" of classification. To prevent confusion, the similarity of form determining families should be based on structure, and not on mere resemblance. A genus is a group of species having the same essential structure. Thus the allied species, the cat, the tiger, and the lion, belong to one genus. A species is the smallest group of individuals which can be defined by several constant characteristics. A cross between two species, as the horse and ass, is called a hybrid, as the mule. Individuals are the units of organic life. A complete animate existence is an individual, whether separate, as man, or living in a community, as the coral. When two or more individuals differ by a single peculiarity, such as color or outline, or size, one is called a variety of the other, as the races of men and breeds of cattle. A cross between distinct races is called mongrel. Vegetables and animals are separated from each other under the term kingdom, and the types of structure in each kingdom are called subkingdoms. Thus in the animal kingdom we have the subkingdoms of vertebrates, radiates, etc.

It must be borne in mind that there are no such things as genus, species, order, class and so forth. They are but abstract terms, expressing relation to a plan, or the harmony of intelligent design which presides over all things. In the article on BOTANY (*q. v.*) will be found a descriptive account of vegetable organic forms, so that in this place we shall deal exclusively with the animal kingdom and its types, viz., the protozoa, radiata, mollusca, articulata, and vertebrata.

It should be remembered that in ascending upward in the scale of life the protozoa, the lowest type of animal existence, begins where the exogens, the highest form of vegetable existence, leave off.

*Protozoa.*— The protozoa are the primitive animals, each of which is composed of a single mass of bioplasm, like the simplest vegetables, or protophytes. The great difficulty of distinguishing the lowest plants and animals has led some naturalists to separate them from the animal and vegetable kingdoms and combine them into one group with various names, such as infusoria and zoöphytes. The bodies of the protozoa consist either of a simple cell or of an aggregation of cells, each of which seems to retain its separate existence. In the rhizopoda we find many genera and species whose minute, often microscopic, shells are of singular beauty. These are generally perforat-

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ed by a large number of fine openings for the passage of the pseudopodia, and hence are termed foraminifera, from *foramen*, "an aperture." The chalky cliffs of England are composed of countless millions of the lifeless skeletons of these tiny organisms. In the infusoria, or animalcules, ("to pour over, or make an infusion," because these organisms were first observed in infusions,) we have the class of organisms which abound in any infusion of vegetable or animal matter which is allowed to putrefy. The class is divided into three orders: *Ciliata*, (hair-like); *Suctoria* (suckers); and *Flagellata* (*flagellæ*, or "filaments"). The foraminifera constitute an important element in the mud which covers the floor of the Atlantic Ocean. The sponges are the most important members of this division of the animal kingdom, and the only ones that attain to any considerable size. What we familiarly call a sponge is but the skeleton of a colony of protozoa. In none of the protozoa can a nervous system or organs of sense be discerned, and only in one group is there any trace of a mouth.

*Radiata.*—These derive their name from the organs of sense and motion being bestowed as rays around a center. "In Radiates," says Agassiz, "we have no prominent bilateral symmetry, such as exists in all other animals, but an all-sided symmetry, in which there is no right, no left, no anterior and posterior extremity, no above and no below." Radiate animals are subdivided into Cœlenterata and Echinodermata. The Cœlenterata (*koilos*, "hollow," and *enteron*, "intestine") are animals with an alimentary canal communicating with the general cavity of the body, and are subdivided into two classes, Hydrozoa and Actinozoa. The first of these two classes may be represented by the hydra and the latter by the sea anemone. Among this class are the Medusæ, or jelly fish, and the Physalia, or Portuguese man-of-war. The coral polyps are Actinozoa which secrete coral, generally composed of a carbonate of lime, but it is occasionally horny, or a mixture of horny and calareous matter. These polyps are usually found in colonies formed by a continuous process of budding. The Echinodermata are distinguished by possessing a digestive and a vascular system, and are especially characterized by their well-organized skin, which in many is strengthened by calcareous plates, and in many has the additional protection of numerous long spines. Among the Echinodermata are the star fishes, the sea urchins, the sea slugs, sea cucumbers, or trepangs. As many as 150 species of star fishes are known. In the Holuthuridæ, or sea slugs, we find a body elongated and soft, with a tough elastic skin. Animals of this sort have the singular power of ejecting all their internal organs, surviving the loss of these parts, and afterward reproducing them.

*Mollusca.*—This subkingdom includes: 1. *Cephalopoda* (cuttle fish, etc.); 2. *Gasteropoda* (snails, etc.); 3. *Scaphopoda* (tooth-shelled animals); 4. *Isopleuro* (the chittons, etc.); and 5, the *Acephala* or bivalves.

*Articulata.*—This type includes all which possess a distinctly jointed body, as worms, crustacea, and insects, and contains, says Wythe, a greater number and variety of forms than all other types put together. The nervous system consists chiefly of a double chain of ganglia along the ventral surface of the abdomen, connected together by nerve filaments. The part representing the brain is in the form of a ring encircling the gullet. The circulatory apparatus is a tubular structure running along the back, and communicating with the body cavity. The limbs, when present, are jointed and hollow, and on the same side as the nerve cords. There are five classes of articulates; the aquatic worms and crustaceans, and the air-breathing spiders, myriapods, and insects. The class of worms, called also annelida (*annules*, "a little ring"), includes animals having a soft skin and a more or less elongated body formed of a succession of rings. The chief orders are the *Tæniada*, so called from their length and flatness, including the human tape worm; the *Trematoda*, or *Flukes*, flat or roundish parasitic worms; the *Turbellaria*, non-parasitic, found on the seashore, under moist stones, or in fresh-water ponds, or in wet ground; *Gordiaceæ*, the horse-hair-like worms found in rain pools; the *Nematoidea*, the thread worm or round worm, both parasitic and non-parasitic, (the common round worm that infects the intestines of children, the "eels" in vinegar and sour paste, and the minute worm found in trichinosis, all belong to the *Nematoidea*); *Leeches*, which are aquatic worms; the *Choetopoda*, or bristle-footed worms, like the lob worm; and the common earth-worm. Nearly all of the *Annelida* are propagated by eggs. The class of the *Crustacea* (from *crusta*, "a crust or shell") includes all articulates possessing jointed legs and gills. They have a double or complete blood circulation, a heart, or dorsal tube, sending off arteries — not found in insects — though the blood as it leaves these tubes escapes into the general cavity. The Crustacea differ in habits as well as in structure, including as they do both land and water crabs, lobsters, barnacles, water-fleas, king crabs,, and the extinct trilobites, shrimps, sand-fleas, craw-fish, and wood-louse. These are variously classed as *Cirripeds*, having feathery arms; *Tetradecapods*, small 14-footed species; *Decapods*, having 10 legs, as the shrimp, etc.; the *Arachnida* (*arachne*, "a spider") is a class much resembling the Crustacea, barring the body, divided into a cephalo-thorax and ab-

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domen. This class includes mites, scorpions, and spiders. The last named are the most intelligent and wily of the articulates. They display great skill and industry in weaving their webs and in constructing their nests, while their brain is of large size, and the nervous system greatly concentrated. The Myriapoda is a small class, including centipedes and millipedes, characterized by very numerous legs — sometimes 100 pairs — some harmless, others venomous, and in hot countries dangerous to human life, as the centipede. The class of *Insecta* contains more species than all the rest of the animal kingdom combined, 150,000 having been already noted and described. The number of species included in the order *Insecta* is too many for enumeration here. They include the orders *Neuroptera*, (dragon flies, may flies, ant lions, termite ants, etc.); *Orthoptera*, (crickets, grasshoppers, locusts, cockroaches, etc.); *Hemiptera*, (plant lice, bed bugs, lice, squash bugs, water boatmen, 17-year locusts, cochineals, etc.,); *Coleoptera*, (the largest of the orders, all beetles, etc., lightning bugs, weevils, lady birds, diving beetles, etc.); *Diptera*, (house flies, gnats, gad flies, etc.,); *Lepidoptera*, (butterflies, sphynges or evening moths, etc.); *Hymenoptera*, (wasps, ichneumons, saw flies, bees and ants).

*Vertebrata.*— This type or subkingdom, whose name means "provided with a backbone," is at once the most important and the most distinct branch of the animal kingdom. Vertebrates may be briefly characterized as animals possessing an axial skeleton and two cavities — one dorsal, or above the spinal column, for the accommodation of the cerebro-spinal system, and the other ventral, or below the spinal column, and containing the intestinal canal and other viscera. The creatures possessing these characteristics are the mammals, or viviparous warm-blooded quadrupeds and cetaceans, the birds, the reptiles, and the amphibians, and those known under the collective name of fishes. So that the study of the vertebrata includes the herpetology (reptiles); ornithology (birds); and Mammalia (including man). Cuvier first proposed the name vertebrata in 1812, and by him also the subkingdom was separated into five classes — mammals, birds, reptiles, amphibians, and fishes. Vertebrates are the only animals which breathe through the mouth. Fishes are considered the lowest of the vertebrates, yet they are so numerous as to embrace nearly one-half of the subkingdom. Fishes live in the water and breathe by means of gills; they are usually covered with scales, and have fins instead of limbs; they have eyes, but no external ears, and the teeth are very numerous. The class of amphibia receives its name from the creatures it contains being able to live either on land or water. They are cold-blooded vertebrates, and breathe by gills during some part of their lives, but sooner or later possess lungs. The class includes frogs, toads, newts, salamanders, and several extinct species. The reptilia are air breathing, cold-blooded vertebrates, and differ from fishes and amphibians by never being possessed of gills, and from birds by being covered with scales or horny plates instead of feathers, the skeleton being ossified, never cartilaginous. When limbs are present they have three or more fingers as well as toes. There are four orders of living reptiles, snakes, lizards, turtles, and crocodiles. The order *Ophida*, or snakes, has no visible limits, but a vast number of vertebræ; they are both venomous and harmless, from the terrible python to the diminutive garter snake. The Lacertilia comprise chameleons, blind worms, and lizards, which have snake-like bodies, with four limbs furnished with digits. The chelonia comprise the tortoise and turtles, which resemble the amphibia in some respects, though their structure is very peculiar. The carapace, or case, contains the viscera and muscular system. "The sea turtles, as the edible green turtle and the hawksbill turtle, the latter furnishing the 'tortoise shell' of commerce, have the limbs formed for paddles. The fresh-water forms, as the snapping turtle, are amphibious. Land tortoises have short clumsy limbs, fitted for locomotion on land." The crocodilia are the largest living reptiles, and the class includes crocodiles, alligators, and gavials. The aves, or birds, are warm-blooded vertebrates, clothed with feathers, the bones being very compact and light, somewhat ivory-like. The feathers of birds are cutaneous growths. The birds are divided into a number of orders, according to well-marked characteristics, which we will briefly enumerate: (1) The *Natatores*, or swimmers, having the body boat-shaped and the feet webbed for paddles, includes penguins, divers, cormorants, pelicans, gulls, petrels, terns, ducks, geese, swans, and flamingoes, etc. (2) The *Grallatores*, or waders, have long stilt-like legs, and include rails, coots, water hens, cranes, herons, stilts, ibises, snipes, sandpipers, woodcocks, curlews, spoonbills, plovers, bustards, lapwings, etc. (3) The *Cursores*, or runners, have the wings rudimentary and unfit for flight; the legs are hollow, long, and strong; they include ostriches, cassowaries, etc. (4) The *Rasores*, or *gallinaceæ*, the scratchers or fowls, comprise almost all the domestic varieties, as turkeys, common barn-yard fowls, partridge, grouse, pheasants, ptarmigans, pea fowls, etc. (5) *Columbæ*, or pigeons, are renowned for swift flight; pigeons, doves, and the extinct dodo are found in this order. (6) The *Scansores*, or climbers, include parrots, toucans, cuckoos, woodpeckers, etc. (7) The *Passeres*, or perchers, are the most numerous

of the orders, including nearly all the smaller birds, and most of the songsters; they are divided into *Conirostres* (cone bills), *Dentirostres* (notched beaks), *Tenuirostres* (slender beaks), *Fissirostres* (cleft beaks). (8) *Raptores*, or raveners, include birds of prey, such as the eagle, vulture, owl, kite, hawk, falcon, and so on; they are readily recognized by the powerful beak and talons or claws, at once weapons of offense, defense, and subsistence; there are two sections, nocturnal and diurnal.

Lastly we come to the mammalia, the warm-blooded vertebrates possessed of mammary glands, by means of which they suckle their young. The thorax and abdomen are separated by a diaphragm, and either a part or the whole of the body is hairy. We have noticed the main characteristics of the mammalia, and it remains to enumerate the various orders. (1) *Monotremata* includes the duck-mole and the spring ant-eater, both natives of Australia. (2) *Marsupiala* (from *Marsupos*, "a pouch") comprises kangaroos, wombats, and opossums; the first two named are restricted to Australia; the young are invariably born prematurely, and are transferred by the mother to a pouch on the abdomen, where they are attached to the nipples and the milk forced into their mouths by special muscles. (3) *Edentata* (toothless) contains such diverse forms as the leaf-eating sloths and the ant eaters and armadillos; the gigantic fossils megatherium and glyptodon belong here. (4) *Rodentia*, the gnawers, include the hare, jerboa, beaver, porcupines, squirrels, rats, mice, etc. (5) *Insectivora*, insect eaters, embrace such little creatures as the shrew, the hedgehog, and the mole. (6) *Cheiroptera* (from *cheir*, "a hand," and *pteron*, "a wing") comprise the bat family, distinguished by long fore limbs, adapted for flight, the fingers being long and united by a membranous web. (7) *Cetacea* (from *ketos*, "a whale") are fish-like in form and habits, and are the largest among living forms; next to the elephant they have the heaviest brains; this order includes the whales, porpoises, and dolphins. (8) The *Sirenia* (*seiren*, "a siren, or mermaid") are similar to the *Cetacea* in form, but frequent great rivers and estuaries, and feed on marine growths; such are the dugong and the manatee. (9) The *Proboscida* include the elephant and the extinct mastodon, dinotherium, and mammoth. (10) The *Ungulata*, or hoofed quadrupeds, include the horse, ass, rhinoceros, zebra, tapir, (odd-toed), and the hog, hippopotamus, and the ruminants — cattle, sheep, goat, deer, camel, stag, etc. (11) The *Carnivora*, or beasts of prey, include the *Pinnigrada*, the seal tribe; the *Plantigrada*, the animals that walk on the sole of the foot, as the bear, badger, and raccoon; the *Digitigrada*, such creatures as walk on the tips of the toes, like the felines, dogs, jackals, otters, weasels, hyenas, etc. (12) The *Quadrumana* (four-handed animals) include the monkey tribes. (13) *Bimana* (two-handed animals) contains but one genus and one species — man.

**Zoömorphic,** in ordinary language, pertaining to or exhibiting animal forms. In anthropology, representing a god or other supernatural being under the form of one of the lower animals. The zoömorphic element in classic mythology appears in such cases as that of the Sminthean Apollo, and the metamorphoses of Jupiter; it is very strongly marked in the religion of ancient Egypt, and traces of it may be found among the Jews and in the poetic imagery of the Apocalypse. (Gen. iii: 24; Exod. xxv: 18; Ezek. x: 14, xi: 18; Exod. xxxiii; Rev. iv: 6, 8, 9; v: 6, 14; vi: 6; vii: 11; xiv: 3; xv: 7; xix: 4.)

**Zoöphyta,** in zoölogy, a term borrowed from Aristotle by Cuvier, and used by him as a synonym of Radiata. The term has no longer any specific value, but is often loosely applied as a designation for many plant-like animals, as sponges, corals, etc., more or less resembling plants in appearance. When the term began to be used by naturalists, it designated a miscellaneous class of beings, which were believed to occupy the space between the animal and vegetable kingdoms, and in which the characteristics of the subjects of each met and were intermingled.

**Zoöpraxiscope,** an optical apparatus invented about 1881, in England, by Eadweard J. Muybridge to exhibit photographs of moving animals. The apparatus was successfully employed at the Royal Institution (in the presence of the Prince of Wales) March 13, 1882, and again in March and May, 1889; also at the Royal Society and other places in the same year. His great work on the subject was published in 1887–1889.

**Zoöspores,** in botany, reproductive bodies of certain Algals of low organization, as many *Confervæ*. They have ciliated processes, which enable them to swim about, and from this animal-like locomotion are with difficulty separated from the infusorial animalcules. Each zoöspore when set free from the tough coat in which it is for a time encysted is capable of living independently.

**Zoöthamnium, in** zoölogy, a genus of peritrichous infusoria, from salt and fresh water; animalcules structurally identical with those of vorticella, ovate, pyriform, or globular, often dissimilar in shape, and of two sizes, stationed at the extremities of a branching, highly contractile pedicle, the internal muscle of which is continuous throughout. There are several species, divided into two groups according as the zoöids of the same colony resemble or differ from each other.

**Zoötoca** (Greek, *zōotokos*, "producing young alive"), a genus of lizards included in the family *Lacertidæ*, and represented by the *Z. vivipara*, the viviparous or scaly lizard, which, with the *Lacerta agilis* or sand lizard are the only members of the lizard group inhabiting Great Britain. The viviparous lizard is common on heaths and in grassy places. It attains a length of six inches; the color is olive-brown above, with a dark line passing along the spine. The under parts are orange, marked with black in the male, and olive-brown in the female.

**Zopfl, Heinrich Matthias** (tsuhpfl), a German jurist; born in Bamberg, April 6, 1807. He became Professor of Public Law at Heidelberg, in 1839. He wrote: "On High Nobility and Equality of Birth" (1853); "Antiquities of the German Realm and Law" (3 vols. 1860–1861); "Principles of the Common German Public Law" (2 vols. 1860); "History of German Law" (3 vols. 1871–1872); "Outline for Lectures on the Philosophy of Law" (1878), published posthumously; etc. He died in Heidelberg, July 4, 1877.

**Zoöpritz, Karl** (tsuhp'prits), a German geographer; born in Darmstadt, April 14, 1838. He was author of "Pruyssenaere's Travels in the Region of the Upper Nile" (1877); "Hydro-dynamic Problems of the Theory of the Tides" (1878); "Guide to Cartography" (1884). He died March 21, 1885.

**Zorgite** (after Zorge, Hartz, where first found), a massive granular mineral, occurring with many other species in the metalliferous lodes of the Hartz; hardness, 2.5; sp. gr., 7 to 7.5; luster, metallic; color, lead-gray, sometimes with a yellowish tarnish; composition: A selenide of lead and copper.

**Zorilla,** or **Zorille,** in zoölogy, *Ictonyx zorilla*, a viverrine mammal, possessing fetid scent glands, allied to the skunks and badgers, extending over Africa and into Asia Minor. Snout elongated, body stout, tail bushy; total length about 20 inches; color, shining black, marked with white spots and bands. It is often tamed, and trained to catch rats and mice.

**Zorilla, Manuel Ruiz** (thō-rēl'yä), a Spanish statesman; born in 1834. He made his début in the Spanish Chamber in 1856, when only 22 years of age, at a time when the Progressist party, led by Olozaga, fiercely attacked the government of Queen Isabella. In spite of his youth he secured general attention and became secretary of the Cortes. When Prim joined the opposition Zorilla became his most intimate friend. After the Madrid insurrection of 1866 Zorilla went to France, where he became closely connected with Sagasta. After the fall of Queen Isabella Zorilla returned to Spain, and became minister of public works during the provisional government of Sagasta, who, however, soon learned to distrust him. On the next change of ministry Marshal Prim appointed Zorilla president of the Constituent Chamber in place of Sagasta, and in that position Zorilla was chiefly instrumental in advocating the candidacy of the Duke of Aosta for the Spanish throne. The monarchy was scarcely installed, however, when Zorilla's sentiments underwent a change, and his hostility to Sagasta, who supported Amadeo, caused him to desert the king and bring about his fall. The government of Alfonso XII. Zorilla opposed from the first. He died June 13, 1895.

**Zorn, Philipp** (tsorn), a German legist; born in Bayreuth, Jan. 13, 1850. He became professor in the University of Königsberg, 1877. Among his writings are: "State and Church in Switzerland," written in collaboration with Karl Gareis (2 vols. 1877–1878); "State and Church in Norway to the Close of the Thirteenth Century" (1875); "Public Law of the German Empire" (2 vols. 1880–1883); "Text-Book of Ecclesiastical Law" (1888); etc.

**Zorndorff** (tsorn'-), a village of Brandenburg, Prussia; 53 miles E. by N. of Berlin. Here a battle was fought Aug. 25, 1758, between the Prussian and Russian armies; the former, commanded by the King of Prussia, obtained a victory over the forces of the czarina, whose loss amounted to 21,529 men, while that of the Prussians was about 11,000.

**Zoroaster** (so the Greeks pronounced the name of ZARATHUSHTRA), the founder or reformer of the ancient religion of the Parsees. He appears as a historical person only in the earliest portion of the Avesta, the Gâthic hymns, where the aspirations, hopes, and fears of an actual human agent are unmistakably present. His name means "Bay camels." His father was Pourusaspa, "Many horses"; his wife was Hvogvi (*i. e.*, of the Hvogvas); his daughter was Pouru-chista, the Discreet. His family name was Spitama. This much we may accept from the statements of documents, but as soon as we leave the last Gâtha, which was the wedding song of his daughter, we have no reliable data. Whether he was born in Ragha, the "Zarathushtrian" province (possibly later so called from its having become a political and ecclesiastical center), or nearer the scene represented in the Vendîdâd (chap. i.), where countries to the E. are mentioned (so more probably), or, again, whether Atropatene was his home, one thing seems certain, which is that all the persons named in the Gâthas belong beside him. Notwithstanding Yasna, xlvi. 1, with its "to what land (district) shall I turn?" which probably gave rise to the erroneous opinion, he was no immigrant or emigrant going prophetically from country to country; for such a ca-

reer at such an age would have been soon cut short by his execution. He is thoroughly at home and among his relatives in the Gâthas. As the center of a group of chieftains, one of whom was the king Vîshtâspa ("Horse-owner"?), he was carrying on with varying success a political, military, and theological struggle for the defense or wider establishment of a holy agricultural State, whose laws and principles encouraged pastoral labor, tillage, and thrift, as against the freebooting tendencies of Turanian and Vedic aggressors. In the course of his career he composed religious-political hymns, the Gâthas, of which we have now only fragments surviving in meters which appear (or reappear) in the Rik and in other parts of the Veda. The period in which he lived is even more uncertain than that of Homer, but cannot be placed later than 800 B. C., and may be greatly earlier. See PARSEES.

**Zorrilla y Moral, José** (thō-rēl'yä ē mō-räl'), a Spanish poet; born in Valladolid, Spain, Feb. 21, 1817. At his father's wish he studied law, but early showed his talent and ambition as a poet. His first collection of verse appeared in 1837; and another, "Songs of the Troubadour: A Collection of Legends and Traditions," (1840–1841). Then followed the drama "Don Juan Tenorio" (1844), containing reminiscences of "Faust"; "Legend of the Cid" (1880); and various collections of shorter verse. He died in Valladolid, Jan. 23, 1893.

**Zosimus,** a Greek historian; author of a "History of the Roman Emperors," from Augustus to A. D. 410. In this work, which is ably executed, he inveighs bitterly against the Christian emperors, particularly Constantine and Theodosius I. The best edition of Zosimus is that of Bekker (1837), forming a volume of Niebuhr's "Corpus Scriptorum Historiæ Byzantinæ." An English translation of the history appeared in 1814 (Military Library).

**Zostera,** in botany, grass wrack; the typical genus of *Zosteraceæ*, which is sometimes reduced to a tribe of *Naiadaceæ*. The species are grass-like sea plants, with matted creeping rootstocks, long, linear distichous sheathing leaves, a foliaceous spathe, with inconspicuous green flowers inserted in two rows on one of its sides. Anthers ovate, sessile, alternating with the ovate germens; style one; stigmas two, elongated, linear; fruit with one seed. Known species two. They are *Z. marina*, the broad-leaved, and *Z. nana*, the dwarf grass wrack. The former has leaves one to three feet long and a many-flowered spadix, the latter has the leaves six inches long and a few-flowered spadix. They occur in muddy and sandy estuaries near low-water mark, the second being the rarer species. *Z. marina* is used largely in continental Europe for packing small fancy articles for exportation, and for stuffing cushions.

**Zosterops** (named from a well-defined circlet of light-colored feathers round the eye), in ornithology, a genus of *Dicæidæ*, with 68 species, ranging over the Ethopian, Oriental, and Australian regions, as far E. as the Fiji Islands, and N. to Peking and Japan. Bill shorter than head, acuminate, finely emarginate at tip; nostrils lateral, linear, covered by a membrane; wings with 10 primaries; tarsi long; tail moderate, even.

**Zouave,** a soldier belonging to the light infantry corps of the French army, which were organized in Algeria, soon after the conquest of that country in 1830, and were originally intended to be composed exclusively of the Kabyle tribe. This idea, however, was soon abandoned, and since 1840 the corps has been composed almost entirely of French soldiers, recruited from the veterans of ordinary line regiments, who are distinguished for their fine physique and tried courage. They still, however, retain the picturesque dress originally adopted, consisting of a loose dark-blue jacket and waistcoat, baggy Turkish trousers, yellow leather leggins, white gaiters, a sky-blue sash, and a red fez with yellow tassel. The few corps composed of Algerines still connected with the French army are now known as Turcos. The name was also given to several regiments which served on the side of the North in the American Civil War, but these were only distinguished from the other volunteer regiments by their picturesque uniform.

**Zouch, Richard** (zöch), an English writer on jurisprudence; born in Anstey, Wiltshire, England, about 1590. Among his celebrated treatises, written in Latin, are: "Elements of Jurisprudence" (1629); "Description of Feudal Law and Procedure according to the Usages of Milan and Normandy, to serve as Introduction to English Jurisprudence" (1634); "Description of Ecclesiastical Law and Procedure according to the Canons and Constitutions of England" (1636); "Explication of Fecial Law and Procedure, or of the Law of Nations" (1650); "The Competent Judge of an Offending Ambassador" (1657). He died in London, March 1, 1661.

**Zrinyi, Count Niklas,** a Hungarian military officer; became famous for his defense of Sziget with 3,000 men against a Turkish army in August-September, 1566. While the enemy was forcing a narrow bridge leading to the castle on September 7, he ordered the gates to be opened and after firing a mortar filled with broken iron into their midst sallied forth at the head of 600 men. He was soon mortally shot and several thousand Turks swarmed into the castle,

where a mine of 3,000 pounds of gunpowder exploded immediately after their entrance, causing great carnage.

COUNT NIKLAS ZRINYI.

**Zschokke** (tshok'kuh), **Johann Heinrich Daniel,** a German author; born in Magdeburg, Germany, March 22, 1771. He was educated at the University of Frankfort-on-the-Oder, and settled in Switzerland, in which country he held an honored position in connection with education and public affairs, and with the press. His autobiography, several of his tales, and the "Hours of Devotion," have been translated into English.

**Zucchero** (dzuk'e-rō), or **Zuccaro** (dzuk'a-rō), **Taddeo** and **Federigo,** two brothers, Italian painters of the 16th century; chiefly noted in their own country for their fresco paintings. Federigo, the younger of the two, went to England in 1574, and received commissions to paint the portraits of high personages, among them those of Queen Elizabeth and Mary Queen of Scots. His portrait of the latter was engraved by Vertue.

**Zuchetto,** in the Roman Catholic ritual, the skull cap of an ecclesiastic covering the tonsure. That of a priest is black, of a bishop or monsignor purple, of a cardinal red, and of the Pope white.

**Zug** (tsög), a central and the smallest undivided canton of Switzerland; bounded by Zürich, Schwyz, Lucerne, and Aargau. The surface, which is generally mountainous in the S. E. and S., where the Rossberg occupies the frontier, slopes more or less gradually N. and W., till it becomes comparatively flat. The only lakes deserving the name are those of Zug and Egeri. The climate, rigorous in the mountainous districts, is mild on the lower S. slopes. The chief exports are cattle, fruits, cider, and "kirschwasser." Area, 92 square miles; pop. (1908) 26,397. ZUG, the capital, stands on the N. shore of the lake, is 12 miles N. E. of Lucerne, with which and with Zürich, it is connected by railway.

**Zug, Lake of,** or **Zugersee,** a small body of water lying chiefly in the canton of Zug, Switzerland, 9 miles long N. to S., and in breadth from 3 miles to 1 mile. The shores are low in all directions except the S. and S. E. In the former direction the Rigi with Mount Pilatus towering behind it, and in the latter the Rossberg, rise in lofty precipices, presenting scenery of a grand description. At the foot of the Rossberg the lake is 1,200 feet deep. The fishing, principally pike and carp, is productive.

**Zuider Zee,** a large gulf of the North Sea, penetrating deep into the Netherlands; about 60 miles in length, and 210 miles in circumference. The islands Texel, Vlieland, Ter Schelling, Ameland, and Schiermonnikoog, reaching in a chain from the most N. point of Holland, are the remains of the former line of coast, and form a breakwater against the North Sea. From Dunkirk in French Flanders to the N. of Holland the interior is defended from the sea by sandhills or dunes. Here, as at the mouth of the Scheldt, the sand barrier was broken, and in 1282 the waters overflowing the low lands separated the province of Friesland from the peninsula of North Holland, and, having united with the small inner lake Flevo, formed the present Zuider Zee. In it lie the islands Wieringen, Urk, Schokland, and Marken. From the S. W. of the Zuider Zee a long narrow arm, called the Y (pronounced *I*), formerly ran nearly due W. through the peninsula of Holland. A strong sea dyke and locks have been constructed to cut off the Zuider Zee from the Y, through which there is a broad ship canal between Amsterdam and the North Sea. On both sides of the canal the Y has been drained and turned into about 12,000 acres of rich land. The waterway was formally opened by the king in 1876. A drainage scheme which a state commission (1892–1894) recommended, proposed to reclaim in 31 years, 450,000 acres at an estimated cost (with compensation to fishermen) of $155,000,000.

**Zulu Bay.** See ANNESLEY BAY.

**Zululand.** See NATAL.

**Zulus,** or **Amazulus,** that branch of the great Bantu division of the human family found in Natal, South Africa. Among the Bantu tribes, the Zulus are conspicuous for their physical and intellectual development. By nature the men are brave and are given to field sports, and, where opportunity offers, to border forays and intertribal strife. The Zulu polity is that of a pure democracy, the chiefs being elected, and holding office during the pleasure of the people. This pleasure is expressed through parents to subheads of districts, through them to the heads of larger districts, and through these in turn to the chief direct. Legislation occurs in the same way, through an expression of feeling from the body of the

people to the chief through the heads of districts. A very complete, though unwritten, code of law, civil and criminal, exists and is well known to every adult Zulu. Polygamy is practised throughout the country, and has been from time immemorial; the marriage tie, however, with the 10th or 20th wife is as sacred as where monogamy prevails. As a race the Zulus are conspicuous for their morality and freedom from drunkenness and crime. Missionary efforts to Christianize have been more tolerated and acquiesced in than successful. The pursuits of the people are pastoral. Trading is little known, and the arts are limited to the primitive needs of simple iron work, pottery, and ornaments of copper, ivory, horn, or wood.

In the beginning of the 19th century the Zulus proper were a small clan who, responding to the ambition of the warlike chieftain Tshaka, became embroiled with most of the neighboring tribes, with the result that 100 or more clans, once considered as strong as the Zulu clan, were attacked in detail and compelled to acknowledge fealty to the Zulu clan proper. Tshaka during the first quarter of the century dominated South Africa practically from the Zambesi to the Cape Colony, and this as conclusively and successfully and by much the same methods as Napoleon dominated Europe for the time. Subsequent to this date the Zulus became restricted in this dominion by the advent of pioneer Europeans in the Cape Colony and the Dutch republics and Natal. Tshaka was succeeded in 1828 by his brother Dingaan, who was assassinated for political reasons. He in turn was succeeded by Umpanda, who reigned over a third of a century, dying in 1873. He left as his successor Cetewayo, who reigned from 1874 till 1878 as paramount chief over a Zululand which included not only the Zululand of today, but a large portion of what is now within the borders of the Transvaal and Amatongaland.

ZULU YOUTH.

In 1878 Sir Bartle Frere, High Commissioner for South Africa, assumed the policy that British interests in the territories bordering on Zululand were threatened by the existence of the independent nation occupying that country. Acting on this policy, he, in opposition to the views held by Sir Henry Bulwer and other officers of the crown in South Africa, sent on Dec. 11, 1878, an ultimatum to Cetewayo, which was of a nature to create war between the Zulus and the British. War being declared, active steps were taken to invade and subjugate Zululand. Lord Chelmsford was detailed to conduct the military operations. Five columns were thrown into the country, but owing to mismanagement they all proved unsuccessful, the main one being almost annihiliated by the Zulus at Isandula, Jan. 22, 1879. The gloom of this fearful disaster was lightly relieved by the heroic and historic defense of Rorke's Drift. The other columns, after a series of small battles, recoiled on their bases, and were either shut up at Etshowe or ordered back to the British side of the Tugela river. Reinforcements were hurried forward from England, and General Sir Garnet Wolseley took command. He arrived in Natal with the latter portion of the reinforcements; but Lord Chelmsford meanwhile had on July 4 won a decisive battle at Ulundi, and the Zulus gave up the contest. England was opposed at the moment to the policy of annexation, and declined to take over the country despite the wish of the subjugated people. The home authorities appointed 13 chiefs to reign where only one had previously ruled, with the result that anarchy and internecine strife ensued.

In 1884, in which year Cetewayo died, England was again asked to exercise sovereign rights in the country, and so pacify it. This the government declined to do, and a party of Boers from the Transvaal entered the country and took sides with the combatants, succeeding ultimately in obtaining for the Transvaal the best portion of Zululand. The remainder was annexed to England under the title of British Zululand. Previous to 1898, it was a dependency of Natal, but now forms an integral part of that colony; area about 12,500 square miles; pop. 181,000.

**Zumala-Carreguy, Tomas,** a Spanish military officer, the greatest of the generals of Don Carlos during the civil war of 1833–1840; born in Ormaiztegua in the Biscayan province of Guipuzcoa in 1789. He left his studies at Pampeluna to fight under Mina against Napoleon, and afterward served under Quesada in the "Army of the Faith"; and on the reëstablishment of absolutism he was promoted colonel, and appointed governor of Ferrol. For his leaning to the party of the Carlists he was tried by court-martial but acquitted; in 1832 with other Carlists he was dismissed from the army. But in 1833 the rising of the Basque population called him to head the Carlist insurrection. His motley army was without uniform, ill fed, and ill paid, yet the vigor and personality of "el Tio Tomas" (Uncle Thomas) were such that he was able to

maintain effective discipline. He kept his opponents at bay, defeated Rodil in the valley of Amescoas, routed another force of Christinos at Viana, gained a second victory in the Amescoas valley, completely defeating Valdez, after a battle of four days, and routed Iriarte near Guernica. These brilliant successes turned the weak head of Don Carlos, and led him to interfere with the plans of his daring and devoted general, who was anxious to strike for Madrid when the Christinos were paralyzed with terror. Zumala-Carreguy was ordered to lay siege to Bilbao, but was mortally wounded by a musket ball, and died 10 days later, June 15, 1835.

**Zumpt, August** (tsömpt), a German classical philologist, nephew of Karl; born in Königsberg, Germany, Dec. 4, 1815. His studies had to do mainly with Roman epigraphy in its relation to history. His principal works are: "The Ancyran Monument" (1845); "Epigraphical Notes" (2 vols. 1850–1854); "Roman Studies" (1859); "Criminal Law under the Roman Republic" (4 vols. 1865–1869); "The Birth-Year of Christ" (1869); "Criminal Trials under the Roman Republic." He died in Berlin, April 22, 1877.

**Zumpt, Karl,** a German classical philologist; born in Berlin, Germany, March 20, 1792. He was appointed Professor of Roman Literature in the University of Berlin in 1836. His greatest work, the "Latin Grammar" (1818; 13th ed. 1874), was translated into English, and is the basis of several of the Latin grammars since compiled for the use of schools. He also prepared annotated editions of several of the Latin classics; and wrote: "Annals of Ancient Kingdoms, Nations, etc." (1819), in Latin; "The Roman Knights and the Equestrian Order" (1840); "On the Duration of the Philosophic Schools at Athens, and the Succession of the Scholarchs" (1843); "On the Law and the Proofs of Extortion" (Repetundarum; 1845); "The Personal Liberty of the Roman Citizen, and its Legal Guarantees" (1846). He died in Karlsbad, June 25, 1849.

**Zunz, Leopold** (tsönts), a German author; born in Detmold, Germany, Aug. 10, 1794; became head-master of the Jewish Normal School for Teachers in Berlin. He was the founder of the "Science of Judaism," the plan of which was laid down in his "A Little about Rabbinic Literature" (1818). Very important was his work "Jewish Teachings Regarding Worship" (1892). Among his other works are: "The Synagogue Poetry of the Middle Ages"; "The Names of the Jews" (1836); "Jewish Requirements as to Oaths" (1859). He died in Berlin, March 17, 1886.

**Zurbaran, Francisco,** a Spanish painter; born in Fuente de Cantos, Estremadura, Spain, in 1598. His genius showing itself early, he was sent to Seville, where he studied the art under Juan de las Roelas. His style bears a strong resemblance to, and is probably an imitation of, that of Caravaggio; so that he early acquired the title of the Spanish Caravaggio. Most of his works are at Seville, and among them his picture of "St. Thomas Aquinas" is considered the best. He was some time employed at Madrid, and had the title of painter to Philip III. and Philip IV. He died in 1662.

**Zurich** (zö'rik), a N. canton of Switzerland; drained by the Rhine and its tributaries, and traversed from N. W. to S. E. by ridges of lofty hills, between which lie three valleys, forming almost its whole surface — those of the Toss, the Glatt, and the Limmat. The last drains the beautiful Lake of Zurich, which, lying 1,341 feet above sea-level, is 25 miles long, and 2½ miles broad at the widest. Zurich has an area of 666 square miles and a pop. (1908) of 484,450. Zurich has not a fertile soil, but it is carefully cultivated. Zurich was one of the earliest seats of the cotton manufacture in Europe, and the spinning and weaving of cotton are still prosecuted with great success. The silk industry is nearly as important; and machinery, bells, type, paper, etc., are also manufactured.

**Zurich,** capital of the canton of Zurich; 41 miles N. N. E. of Lucerne and 43 N. W. of Glarus, at the point where the Limmat issues from the Lake of Zurich and unites with its tributary the Sihl. It is one of the most prosperous manufacturing and commercial towns of Switzerland; yet the narrow streets and lofty houses of its older quarters, on the high ground E. of the river, give it the quaint appearance of a mediæval city. Of the Romanesque cathedral, erected in the 11th and 13th centuries, Zwingli was pastor, as Lavater was of the Peterskirche. The Polytechnic (1864) houses the university, which, founded in 1832, had in 1899 a teaching staff of 124, and 731 students in theology, law, medicine, and philosophy; and one may also notice the town hall (1699), the botanic gardens, the six bridges, and the town library with over 100,000 volumes and 3,000 MSS. Fuseli was a native. Pop. (1909), with suburbs, 183,500.

**Zurich, Lake of,** or **Zürichersee, a** sheet of water chiefly in the canton of Zurich, but partly in Schwyz. Its greatest length is about 27 miles; while its greatest breadth does not exceed 3 miles, and its greatest depth 600 feet. Its scenery is distinguished not so much for grandeur as for beauty. A considerable traffic is carried on on the lake by means of sailing vessels and a number of steamers. It is well supplied with fish. Its chief feeder is the Linth canal, communicating with the Wallenstatter-

see. It discharges itself at the town of Zürich by the Limmat.

**Zurich, Treaty of,** a convention signed in Zurich Nov. 10, 1859, by the plenipotentiaries of France and Austria, which embodied the conditions of the preliminaries of peace agreed to at Villafranca, on the part of Napoleon II. and the Emperor of Austria, Francis Joseph, and closed the Franco-Italian war by Austria's abandonment of her right to Lombardy.

**Zütphen** (züt'fen), a town in the Dutch province of Guelderland; on the Yssel, here joined by the Berkel; 18 miles N. N. E. of Arnhem. Of buildings the chief are the Great Church (1103; restored 1857) and the "Wijn Huis" tower. At Rysselt, 3 miles N., is the boys' reformatory of "Nederlandsch Mettray" (1851). Zütpen has manufactures of paper, oil, leather, etc. It has been several times besieged; and in a skirmish on the field of Warnsfield, a little to the E., Sir Philip Sidney (*q. v.*) received his death wound from a Spanish bullet, Oct. 2, 1586. Pop., commune, 17,004.

**Zvenigorodka,** a town of European Russia, in the province of Kiev; on the Tikitch river; 96 miles S. S. E. of the town of Kiev; has numerous sulphur springs in its neighborhood.

**Zvornik,** a town of Bosnia, Turkey, on the Drina; 68 miles N. E. of Serajevo. The inhabitants are partly Servian, partly Catholic, and to some extent Mohammedan. The coal and lead mines are rich though undeveloped. Zvornik, which is a fortress of great strength, was occupied by the Russians, Sept. 27, 1878.

**Zwickau** (tsvik'ou), a picturesque city of Saxony; irregularly built in its older portions, in a pleasant valley on the left bank of the Mulde; 82 miles S. W. of Dresden. Of its churches the most noteworthy is the Gothic Marienkirche, which dates from 1451, was restored in 1839–1842, and has a tower 285 feet high. The old castle has been converted into a prison. The town carries on many manufactures; but the chief source of its wealth is the rich beds of coal in the surrounding district, which employ 8,000 miners. Pop. (1905) 68,502. For the Prophets of Zwickau, see Anabaptists.

**Zwinger, Theodore, the Elder** (tsving'er) (Latin Zwingerus, zwin-jē'rus), a famous Swiss physician and scholar; born in Basel, Switzerland, in 1533; became Professor of Greek at Basel in 1565. He wrote: "Theater of Human Life" (1565), a collection of anecdotes, etc He died in Basel, in 1588.

**Zwingli** (tsving'lē), or **Zuinglius** (zwing'gli-us), **Ulric,** a Swiss reformer; born in the hamlet of Wildhaus, in the Tockenburg, Jan. 1, 1484. After receiving instruction from his uncle the parish priest of Wessen, he was sent to study first at Basel, then at Berne, and afterward at Vienna. At the age of 18 he returned to his native village, but only to quit it again almost immediately, and renew his studies at Basel. He applied himself to scholastic theology, but gave it up in disgust as a mere waste of time, and soon after rejoiced to hear the teaching of Thomas Wittenbach. Zwingli eagerly studied the classics, and became one of the best scholars of his time. He was also passionately fond of music, and learned to play well on the flute, the lute, the violin, and other instruments. In 1506 he was ordained priest — he had been master of arts for several years — and accepted the place of pastor of Glarus, which he filled with zeal and devotedness for 10 years. During this period thoughts were working in his mind, which were the germs of the reformation to come. He twice accompanied the Swiss auxiliaries to the wars in Italy, fought at the battle of Marignano; and used his influence with his countrymen to dissuade them from foreign military service. In 1514 he had visited Erasmus at Basel, and was greatly influenced by his writings.

The year of 1516 Zwingli has noted as the period of the commencement of the Swiss Reformation. That same year he removed to the secluded monastery of Einsiedlen, of which he was appointed priest and preacher. His clear and eloquent announcement of scriptural truth astonished his new hearers, and drew crowds from the surrounding country to hear him. In 1519, through his high reputation for learning, piety, and eloquence, and the active influence of his friend Oswald Myconius, Zwingli was appointed preacher at the cathedral of Zurich, and was thus brought into the center of the political movement of Switzerland. His preaching produced immense excitement by its novelty; but while most were charmed, not a few were alarmed and angry. In the autumn of the same year he was attacked by the plague (known then as the "great death"), and it was reported that he was dead. He, however, recovered, and with a new vigor and devotedness, and fullness, resumed his work. In 1522 began the action of the court of Rome against the Reformation in Switzerland; the Bishop of Constance, by letter to the chapter at Zurich, attempted to stop the preaching of Zwingli. The latter replied in his "Architeles," and the attempt failed. But an order of the Diet was soon after obtained, which prohibited preaching against the monks. About the same time Zwingli married Anna Reinhold, a widow, and mother of Zwingli's beloved disciple and friend, Gerold. He did not make his marriage known till two years later.

Meanwhile enmity was growing into persecution, and the reformer was sometimes

overwhelmed with the forebodings of evil to come, and the failure of his hopes. Early in 1523 a conference between the advocates and opponents of the new doctrines was held at Zurich, by order of the Great Council; but the discussions, which lasted three days, left the controversy as it was; the reformers arguing on the basis of Scripture, and their opponents from the canon law, and there being no first principles in common with them. Not long after the reformation was publicly established in Zurich, pictures and statues, etc., were taken out of the churches, and instead of the mass a simple form of celebrating the Lord's Supper was adopted. Education was provided for, and convents were suppressed, just regard being had to the interests of their inmates. In 1528 Zwingli attended the important conferences of Baden, and in 1529 that of Marburg, where he agreed on certain articles of faith with Luther and Melanchthon. Two years later, the long suppressed enmity of the cantons which remained Catholic broke out in open war against Zurich and Berne. Delay, indecision, and half-heartedness among the citizens of Zurich made their cause hopeless; and at the battle of Cappel their handful of disorderly troops was easily destroyed or dispersed by the superior numbers and discipline of the Catholic army. Zwingli fell on that field, Oct. 11, 1531. His body was discovered, burnt, quartered, and his ashes mingled with those of swine, and scattered to the winds. The works of Zwingli were published in 1581 three volumes 4to.

**Zwolle,** the capital of the Dutch province of Overyssel on the Zwarte Water; 25 miles N. of Zütphen; was once a strong fortress with 11 bastions and three forts. It is a handsome, well-built city, with three fine suburbs. Its corn market is one of the best in Holland. Its chief buildings are St. Michael's Church, a large and splendid building with a famous organ, the government buildings with the provincial archives, the town hall, and the courts of justice. The town has a Latin school, a school of navigation, an industrial school, a public library with rare works on geography and local history, a museum of natural history, a theater, etc. Zwolle has communication with the sea by means of the Willemsvaart canal. It manufactures oil, spirits, iron goods, and linens, carries on shipbuilding, and a trade in corn and cattle. In a monastery in the neighborhood Thomas à Kempis lived and died. Zwolle was a member of the Hanseatic League. Pop. (1909) 33,729.

**Zygæna,** in entomology, the typical genus of the family *Zygænidæ*. Antennæ of the male not pectinated, much thickened beyond the middle; fore wings elongate, green, with red streaks or spots; hind wings red, with dark margin; abdomen thick. Newman calls this *Zygæna*. To avoid confounding it with the hammerhead shark, Stainton calls it *Anthrocera*, but retains the name *Zygænidæ* for the family. *Z. minos* is the transparent burnet moth, *Z. trifolia.* or *loti*, the five-spotted burnet; *Z. loniceræ*, the narrow-bordered five-spotted burnet moth; and *Z. filipendulæ*, the six-spotted burnet moth. In ichthyology, hammerheads, hammerheaded sharks; a genus of *Carchariidæ*, or of *Zylgænina*, with five species, widely distributed, but most abundant in the tropics. Anterior part of the head broad, flattened, and produced into a lobe on each side, the extremity of which is occupied by the eye; caudal fin with a pit at its root, and a single notch at its lower margin; no spiracles; nostrils on front edge of the head. *Z. malleus* is the commonest species. The genus appears first in the Chalk.

**Zygophyllaceæ,** a natural order of polypetalous dicotyledons, consisting of 17 genera and upward of 100 species of shrubs or herbs with more or less jointed stems, flowers on axillary peduncles, and generally white, red, or yellow, sepals and petals mostly five, and a dry fruit often separating into cocci. The species are widely dispersed over the tropical and sub-tropical zones, a few also occurring in temperate climates. In the type genus *Zygophyllum*, the leaves are opposite and consist of two leaflets (Greek *zugan*, "a yoke," and *phyllon*, "a leaf"). *Z. fabago* has vermifuge properties and its flower buds serve as a substitute for capers. *Z. coccineum* has aromatic seeds employed by the Arabs in place of pepper. The wood called lignum vitæ is the most important product of the order.

**Zymotic Diseases,** a name applied to epidemic and endemic, contagious diseases, because they are supposed to be produced by some morbific principle acting on the system like a ferment (Greek, *zyme*). This morbific principle or poison gets into the blood in minute particles or germs, and there increases and multiplies, the disease lasting till the poison has become worked out, or has been destroyed. The chief of these are measles, scarlet fever, smallpox, typhus, typhoid, diphtheria, whooping cough, croup, and erysipelas.

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